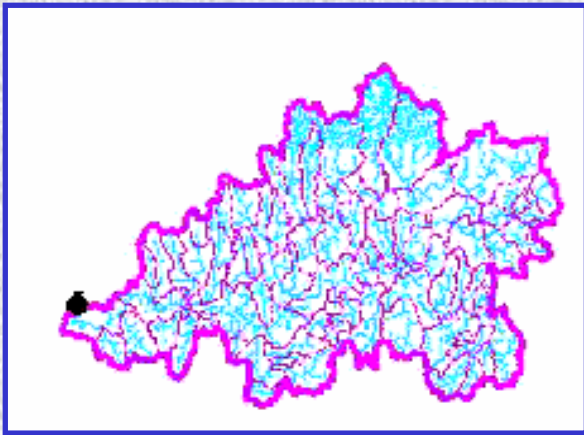
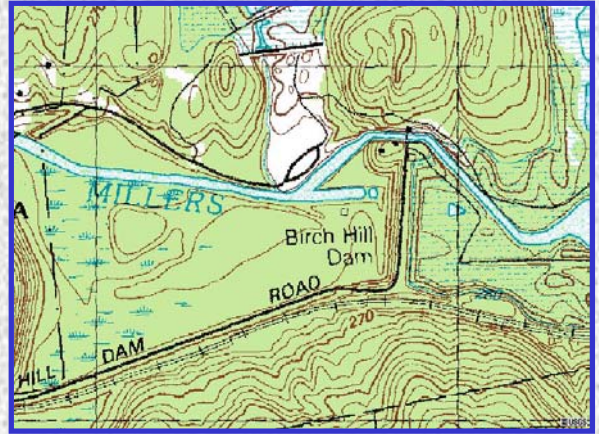




# Massachusetts Department of Environmental Management *Hydrologic Assessment of the Millers River*

## Tables, Figures, Appendices



### Prepared By:

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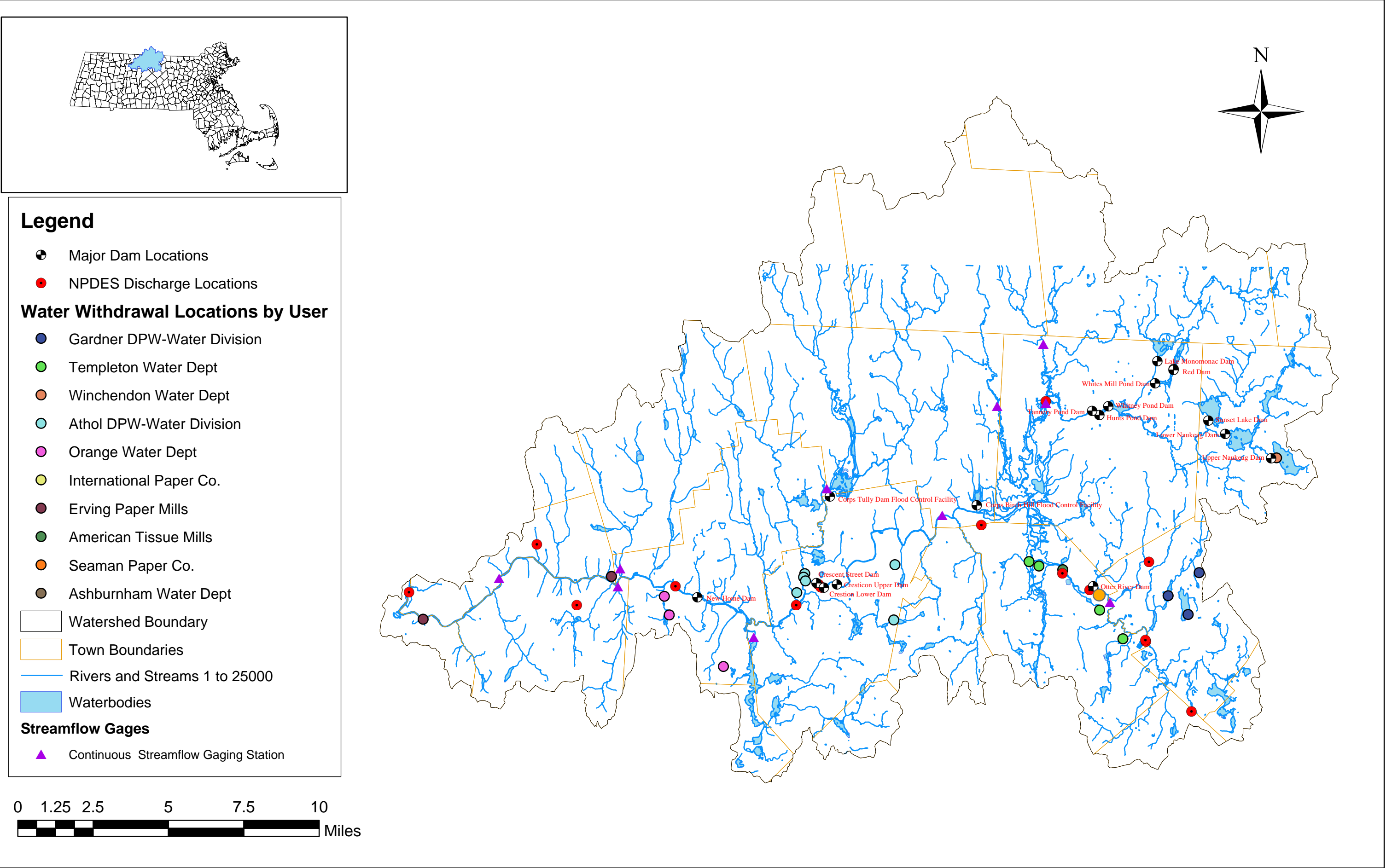
Executive Office of  
Environmental Affairs,  
Massachusetts Watershed  
Initiative, Millers River  
Basin

Final Report, April 2003

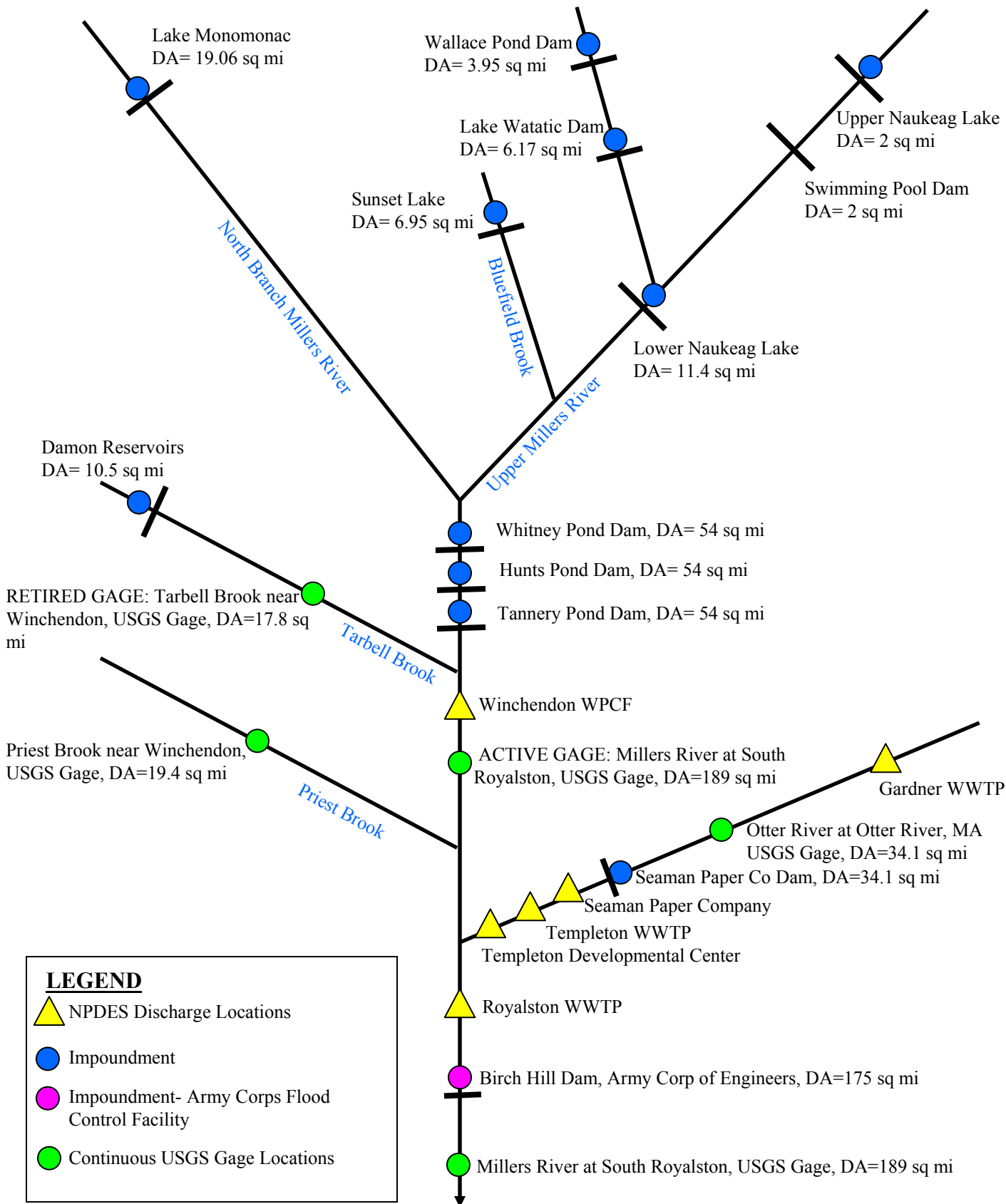
# **SECTION EXECUTIVE SUMMARY: FIGURES AND TABLES**



Figure ES2.0-1 Miller River Basin Map (USGS Gages, NPDES Discharges, Major Dams, Water Withdrawals)



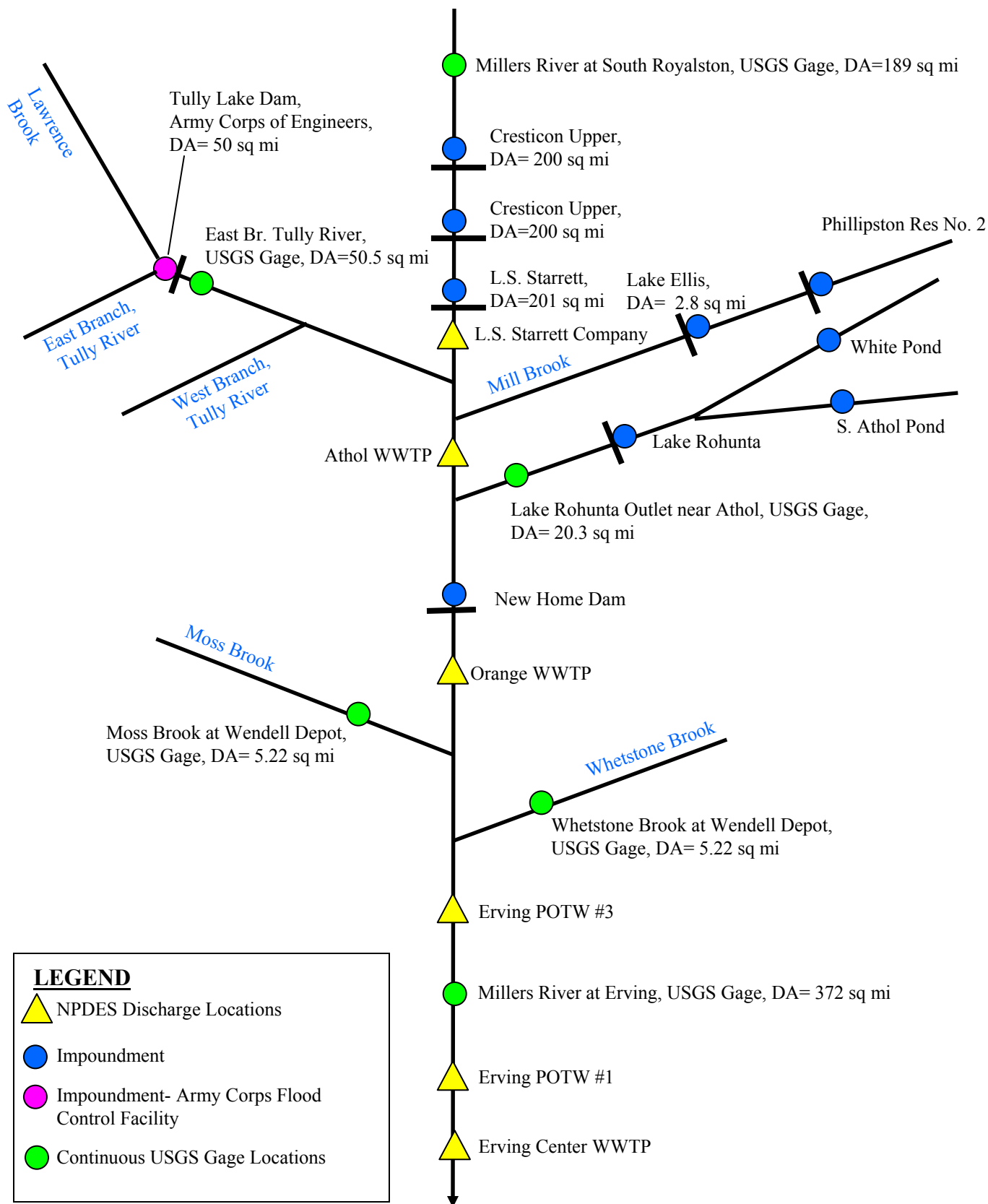
# Millers River Basin Schematic



**FIGURE ES2.0-2**



# Millers River Basin Schematic (continued)



**FIGURE ES2.0-2 (cont)**

## **SECTION 2.0: FIGURES AND TABLES**



Figure 2.1-1: General Locale of Millers River Basin

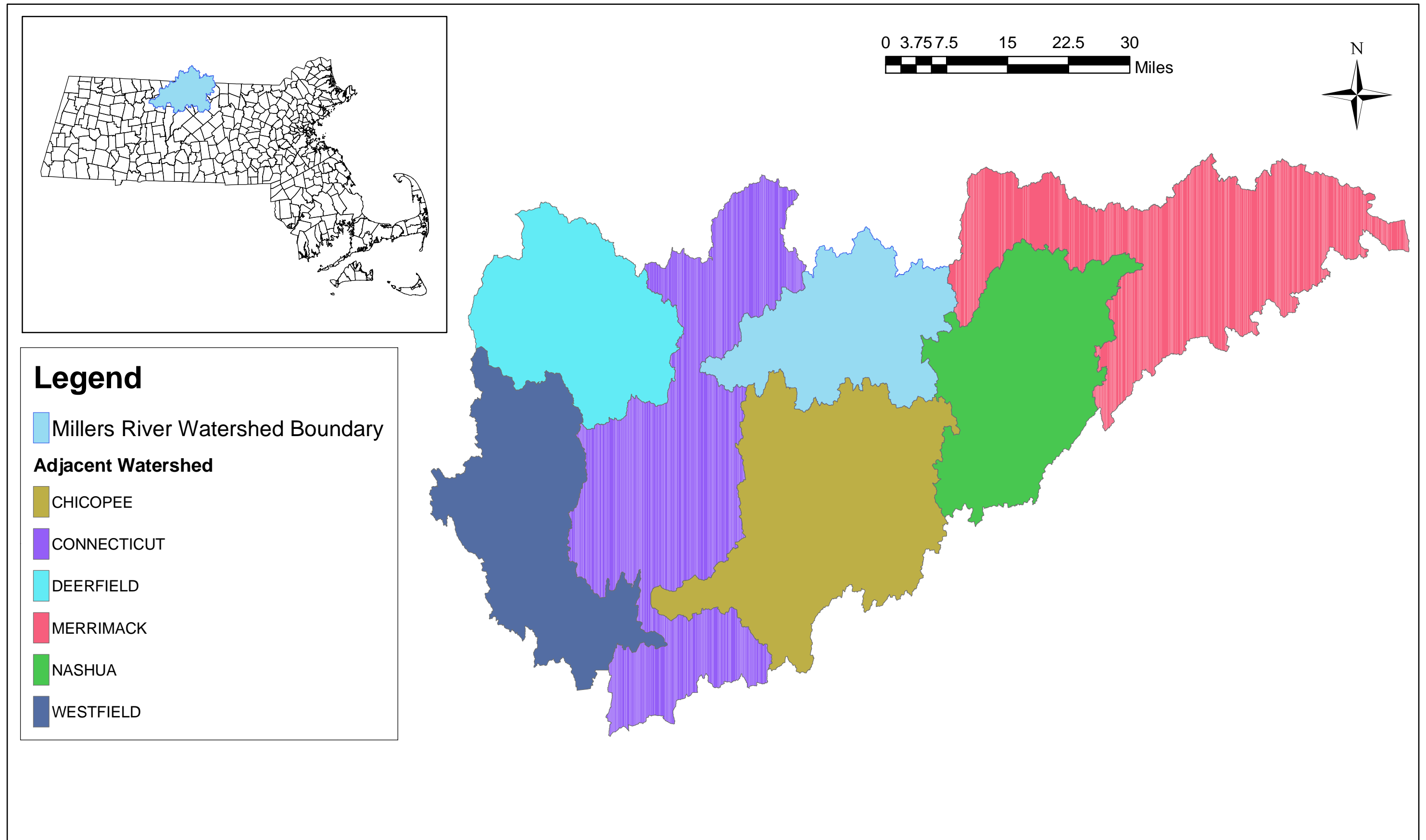


Figure 2.2-1: Millers River Basin Base Map

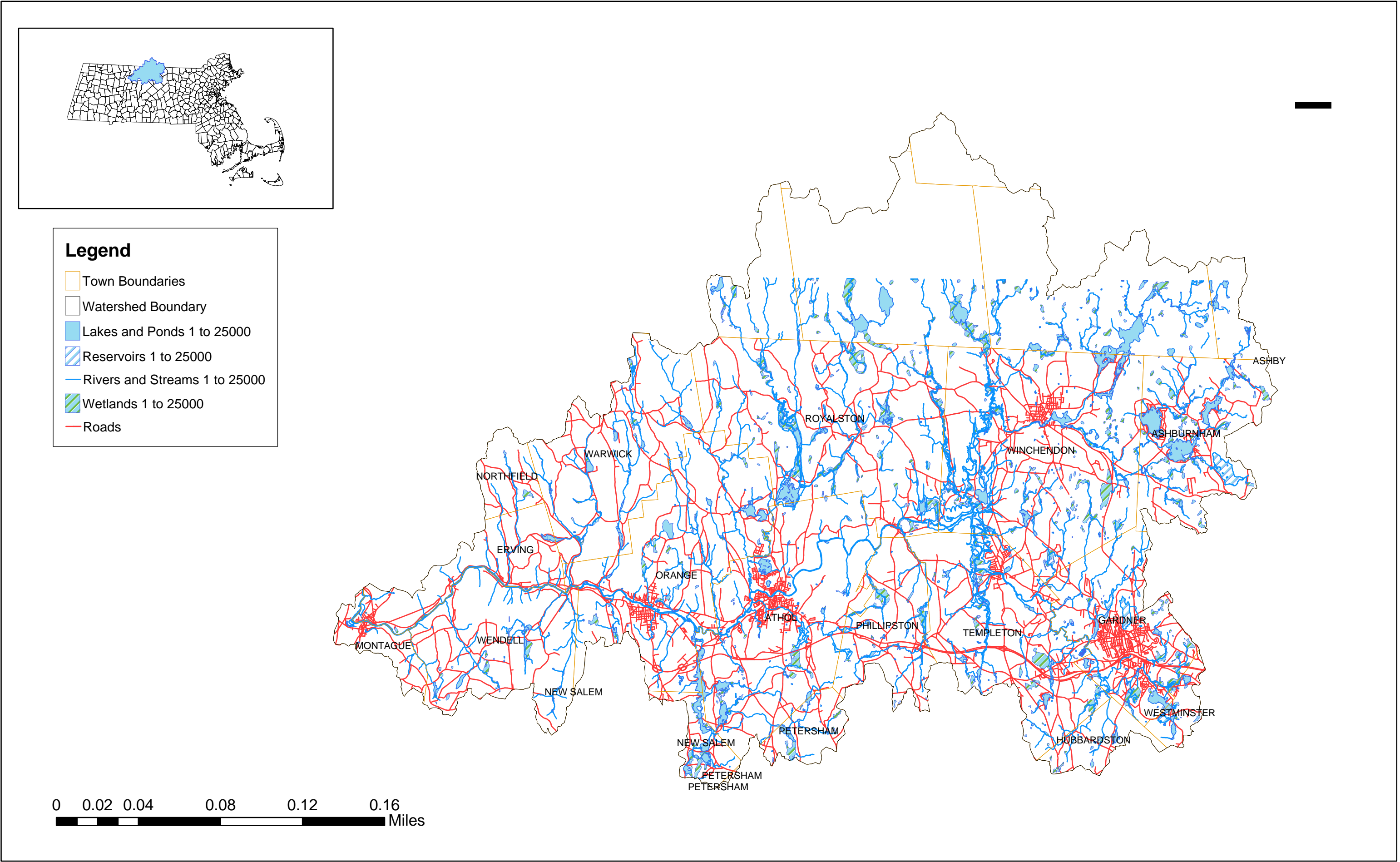
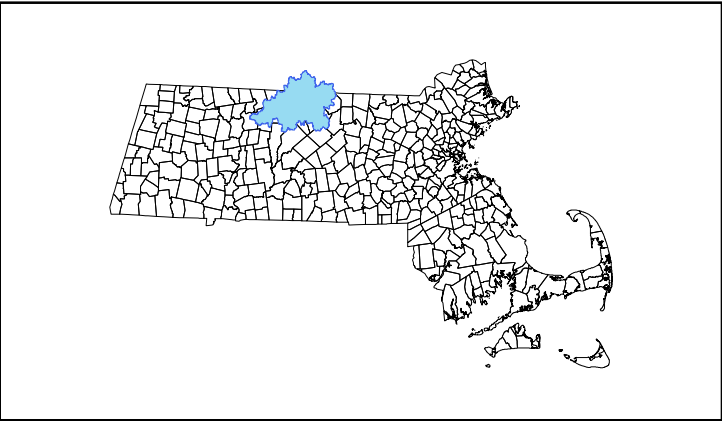





Figure 2.3-1: Millers River Basin Topographic Map



**Legend**

 Watershed Boundary

**Shaded Relief**

 50 - 150

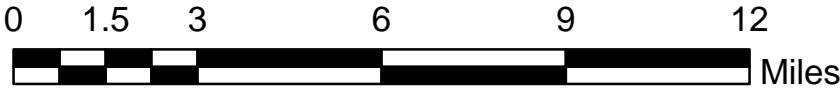
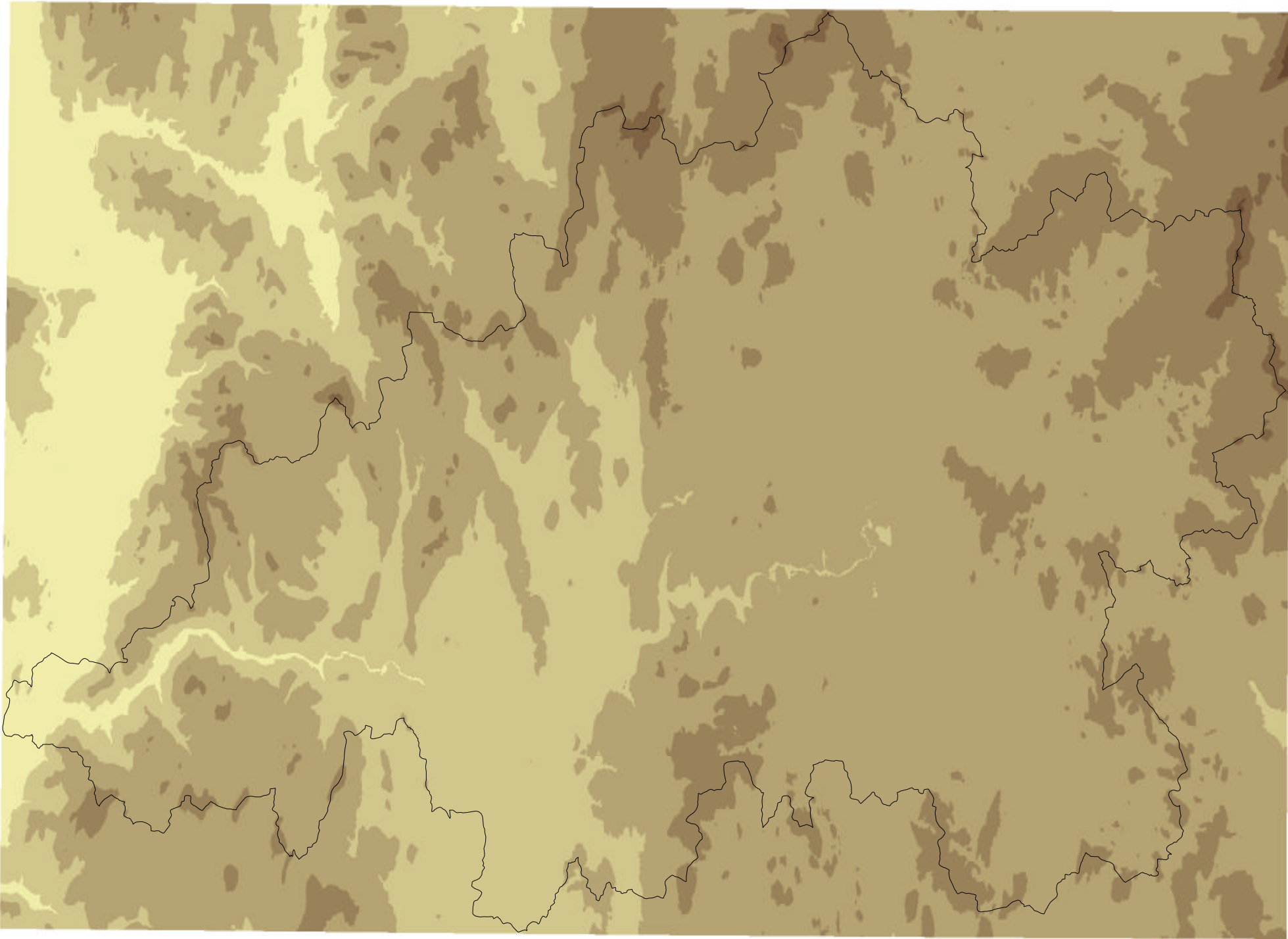
 150 - 250

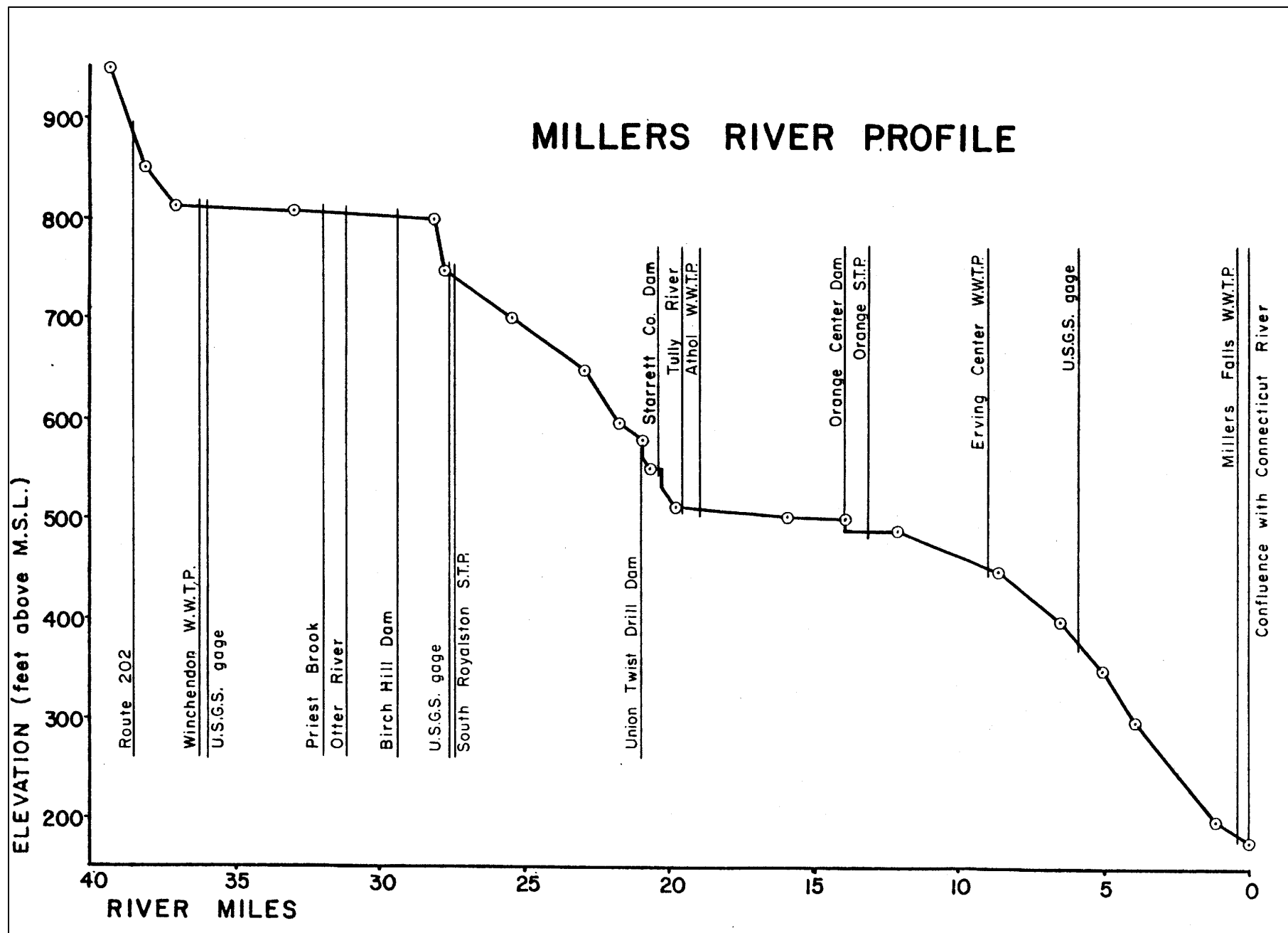
 250 - 350

 350 - 450

 450 - 550

 550 - 610





**FIGURE 2.3-2: Millers River Profile Map** (source: The Millers River Basin- 1987 Water Quality Analysis)

Figure 2.4-1: Millers River Basin Surficial Geology Map

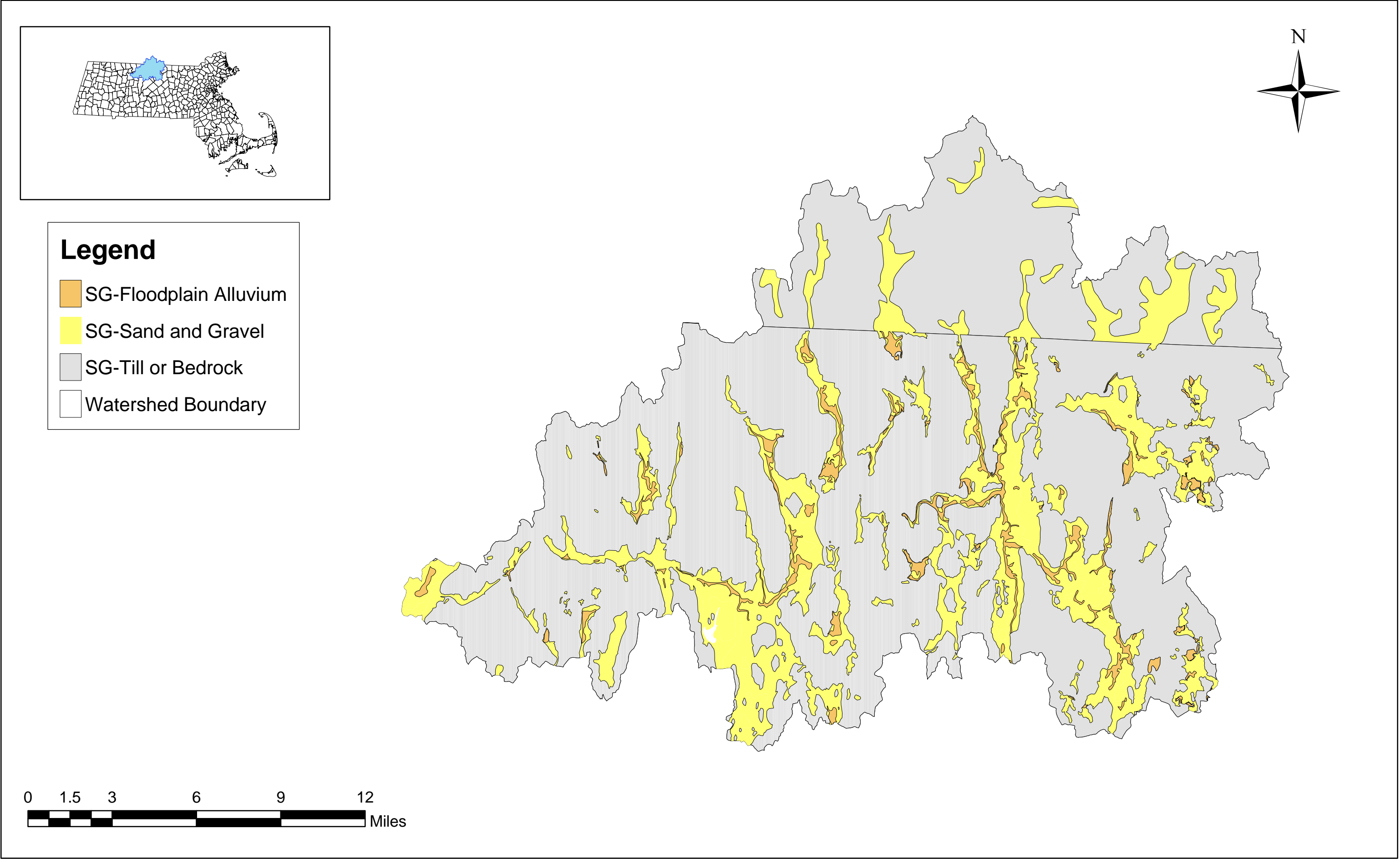


Figure 2.5-1: Millers River Basin Land Use Map

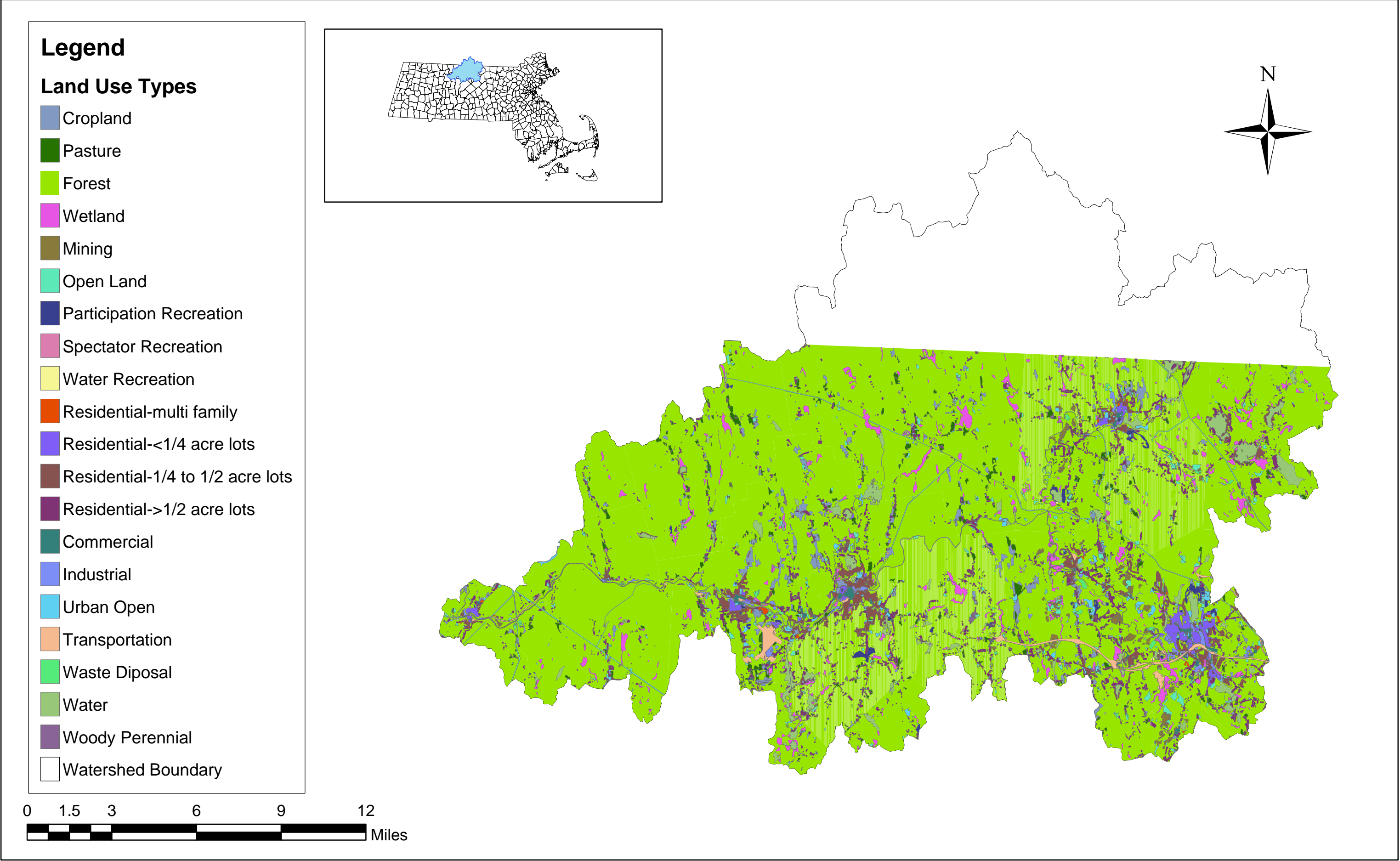
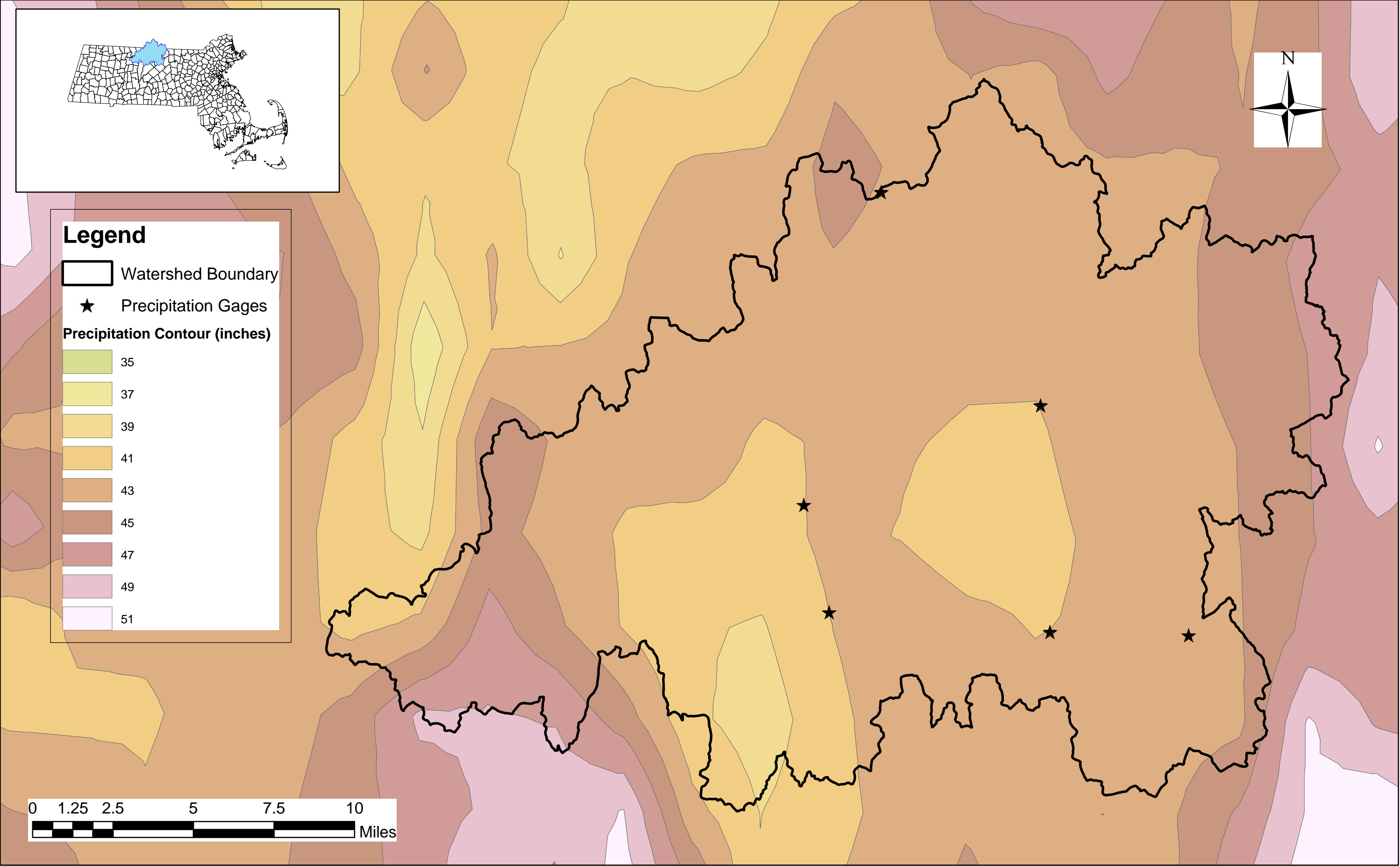


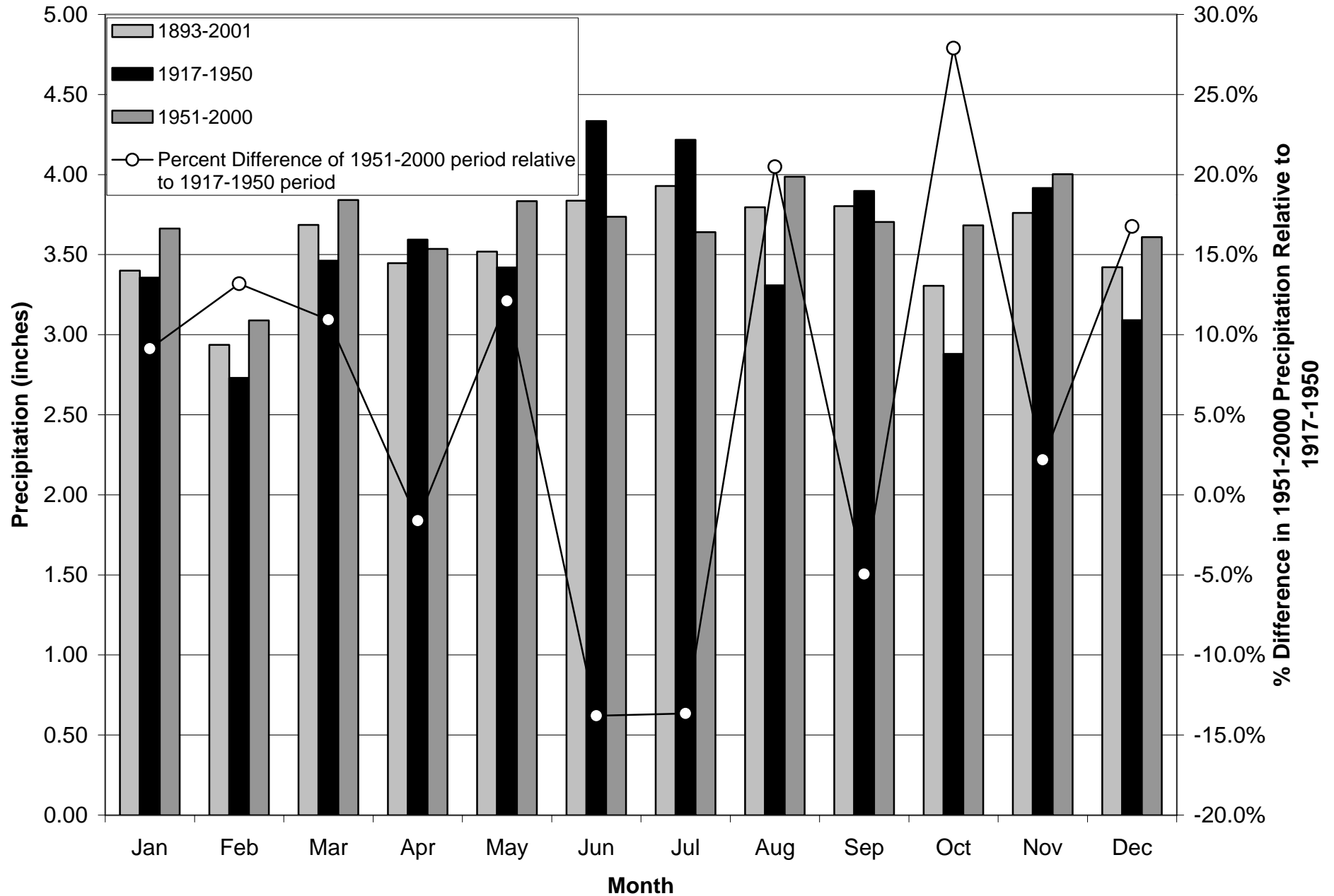


Figure 2.6-1: Millers River Basin-Precipitation Gages and Average Annual Precipitation



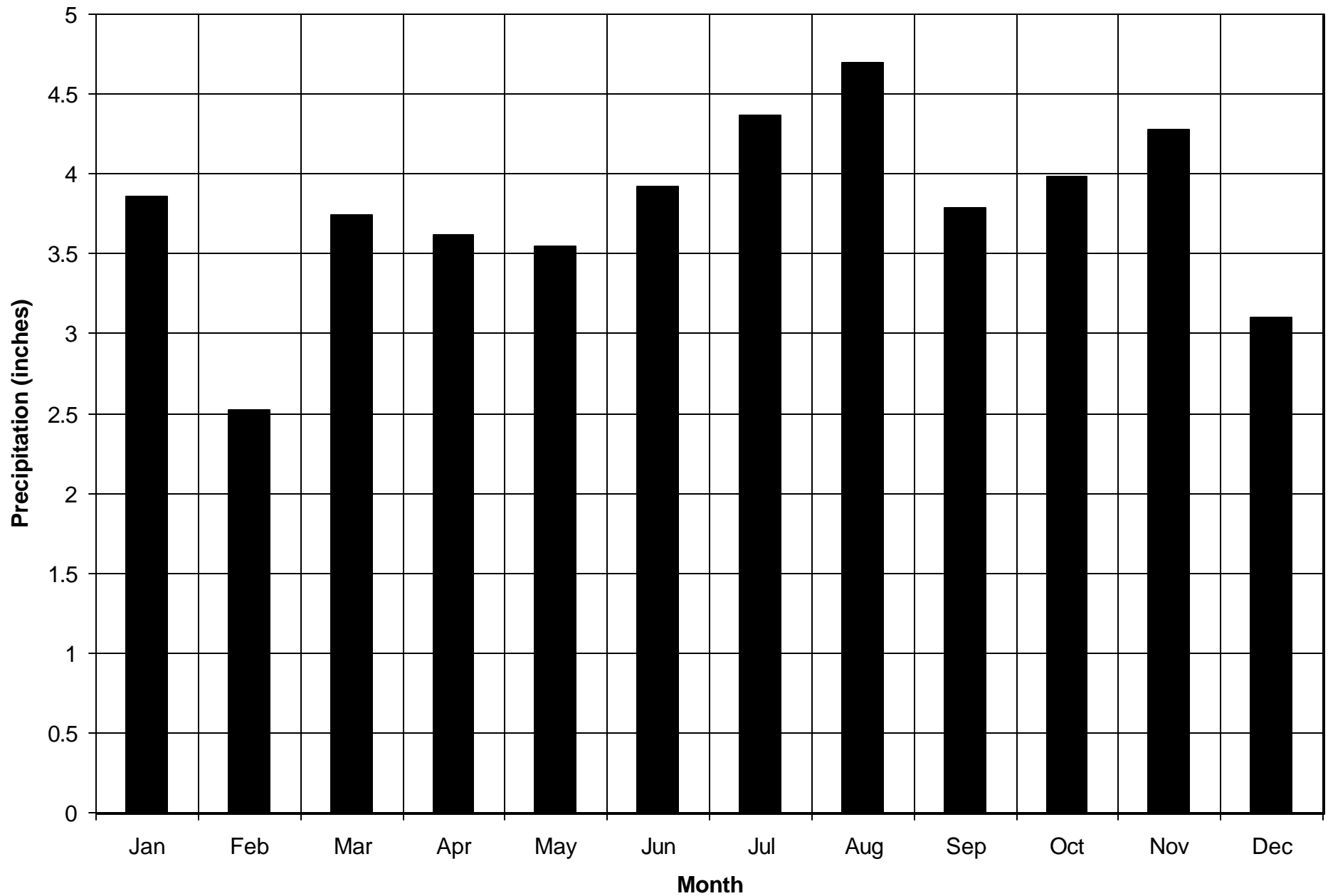


**Winchendon, MA Precipitation Gage- Average Total Monthly Precipitation (inches) for Three Different Periods of Record**



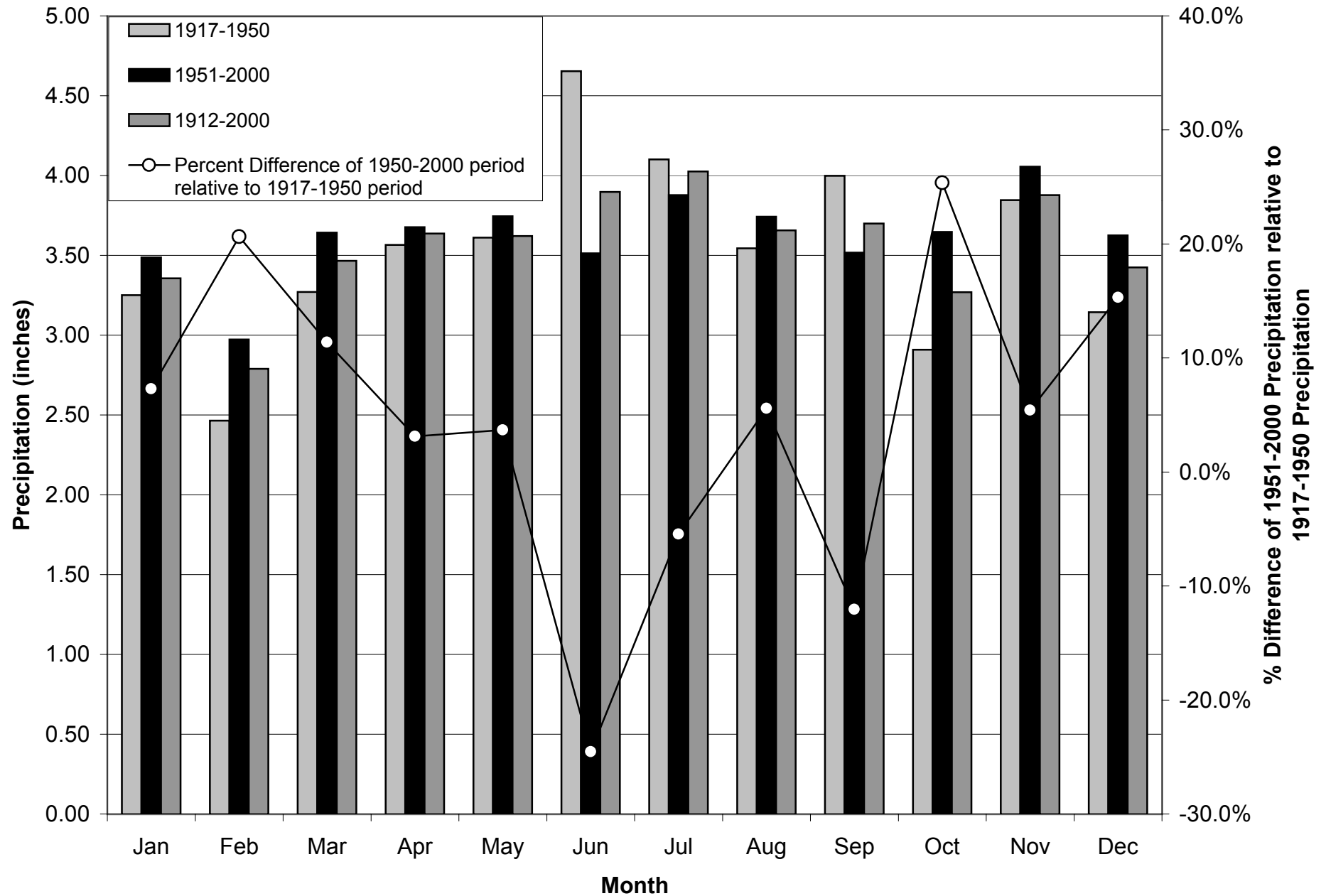
**FIGURE 2.6-2**

**Tully Lake Precipitation Gage- Average Total Monthly Precipitation (inches)**  
**Period of Record: October 1984- September 2000**



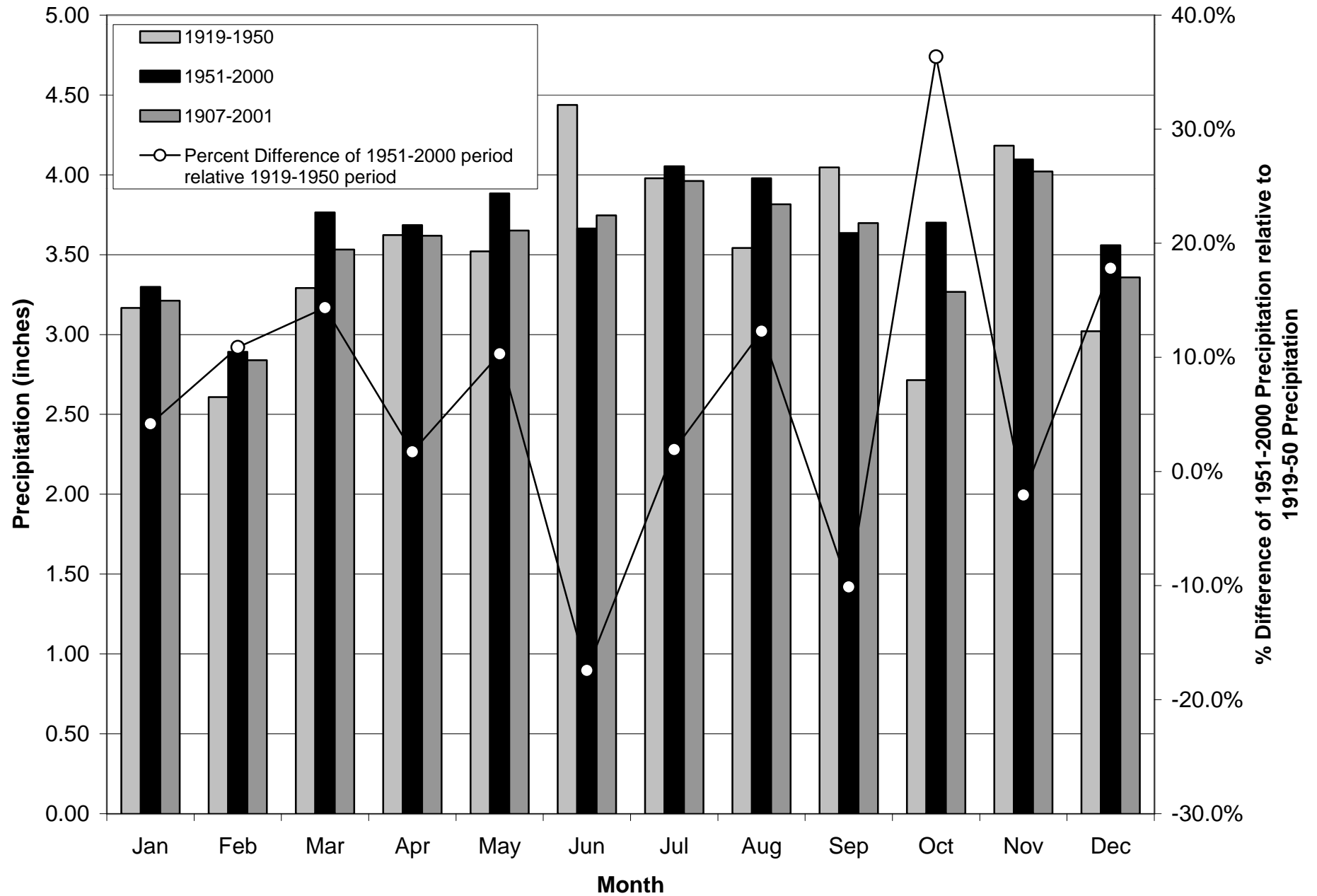
**FIGURE 2.6-3**

**Athol, MA DPW Precipitation Gage- Average Monthly Precipitation Totals for Three Different Periods of Record**



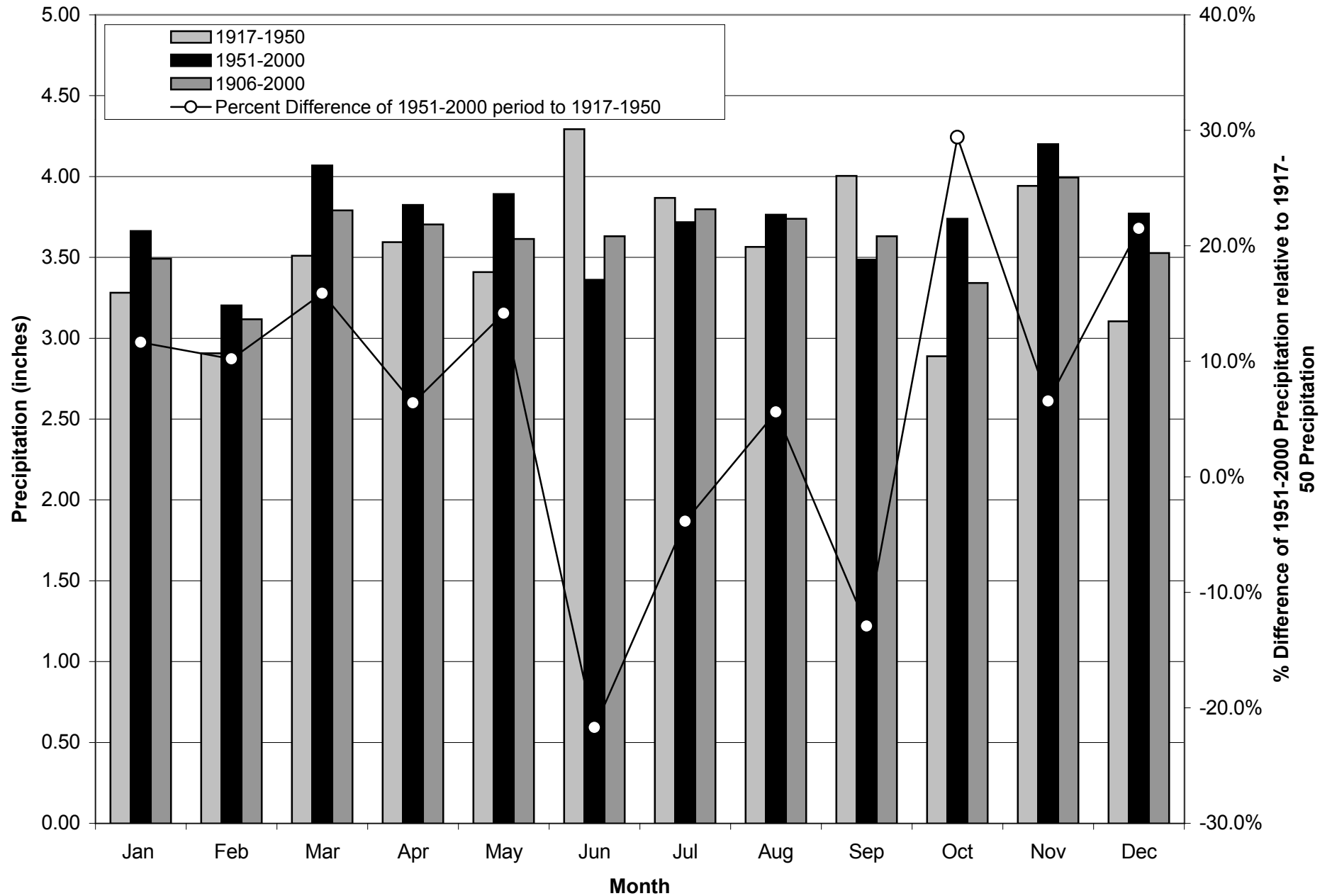
**FIGURE 2.6-4**

**Templeton, MA Precipitation Gage-Average Monthly Precipitation Totals for Three Different Periods of Record**



**FIGURE 2.6-5**

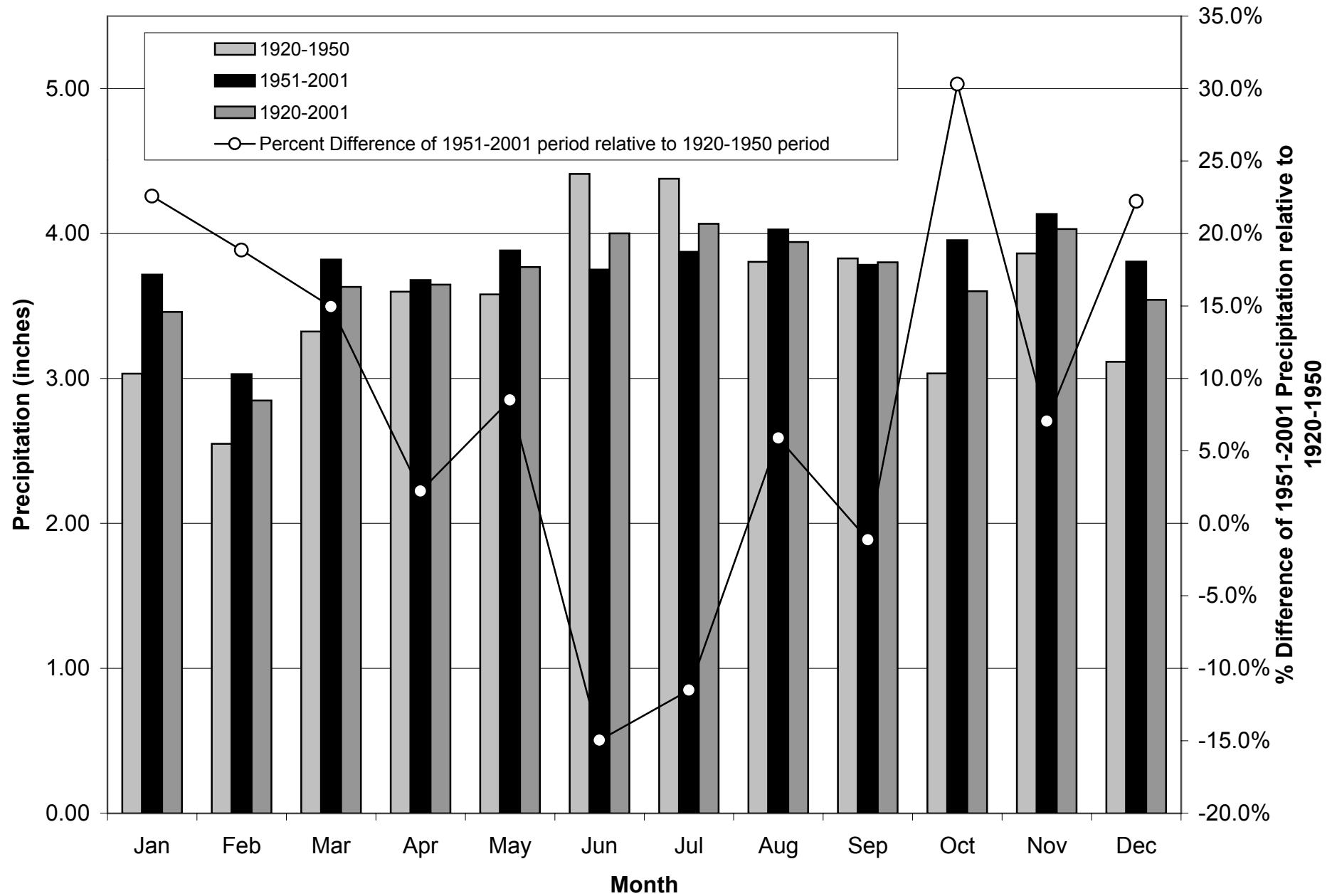
**Gardner, MA Precipitation Gage- Average Monthly Precipitation Totals for Three Different Periods of Record**



**FIGURE 2.6-6**

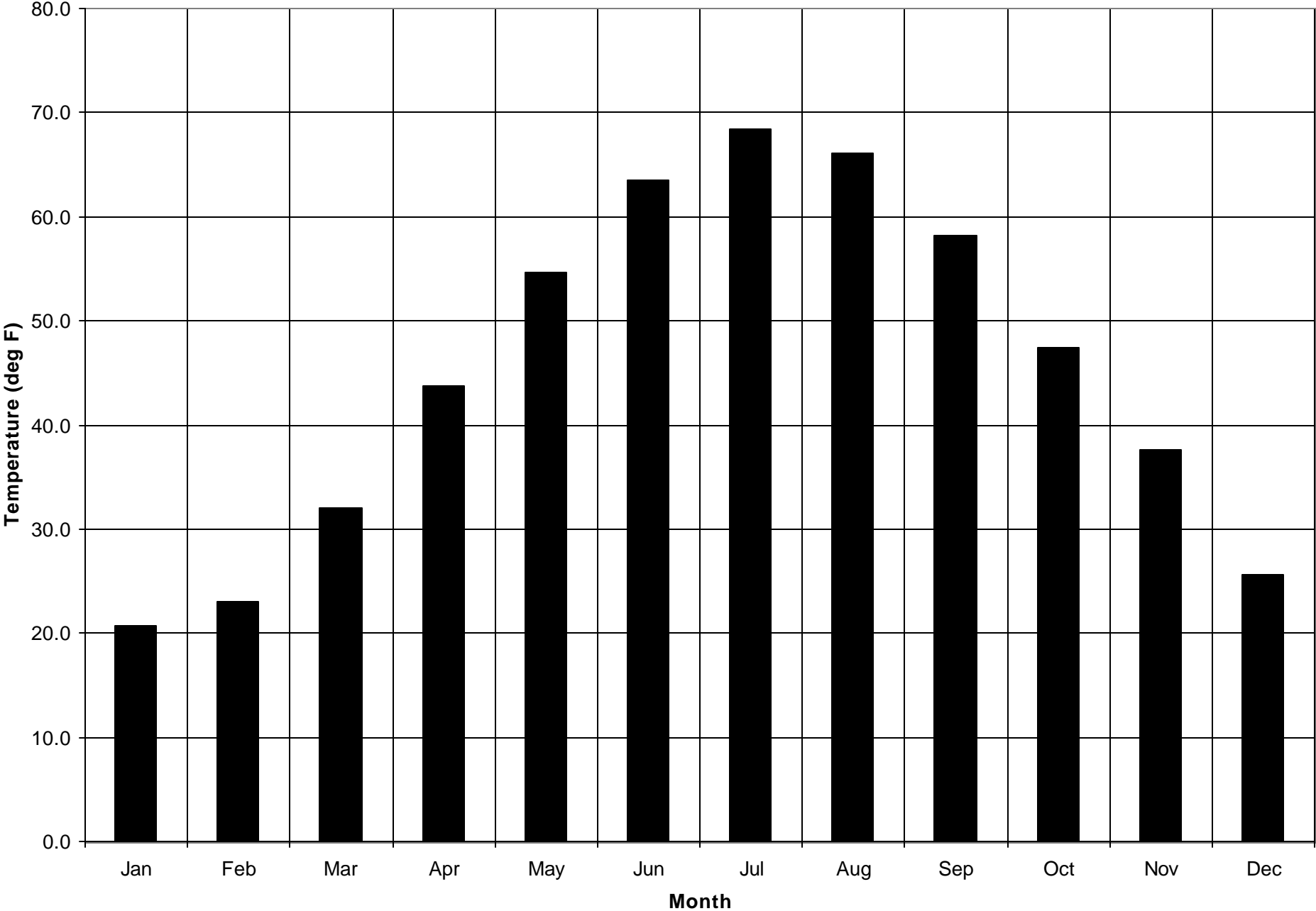


# **Fitzwilliam, NH Precipitation Gage- Average Precipitation Totals for Three Different Periods of Record**



**FIGURE 2.6-7**

**Average Monthly Temperature recorded at Birch Hill Dam, Period of Record: 1949-2000**



**FIGURE 2.6-8**

## **SECTION 3.0: FIGURES AND TABLES**

Figure 3.0-1: Dam Locations in the Millers River Basin

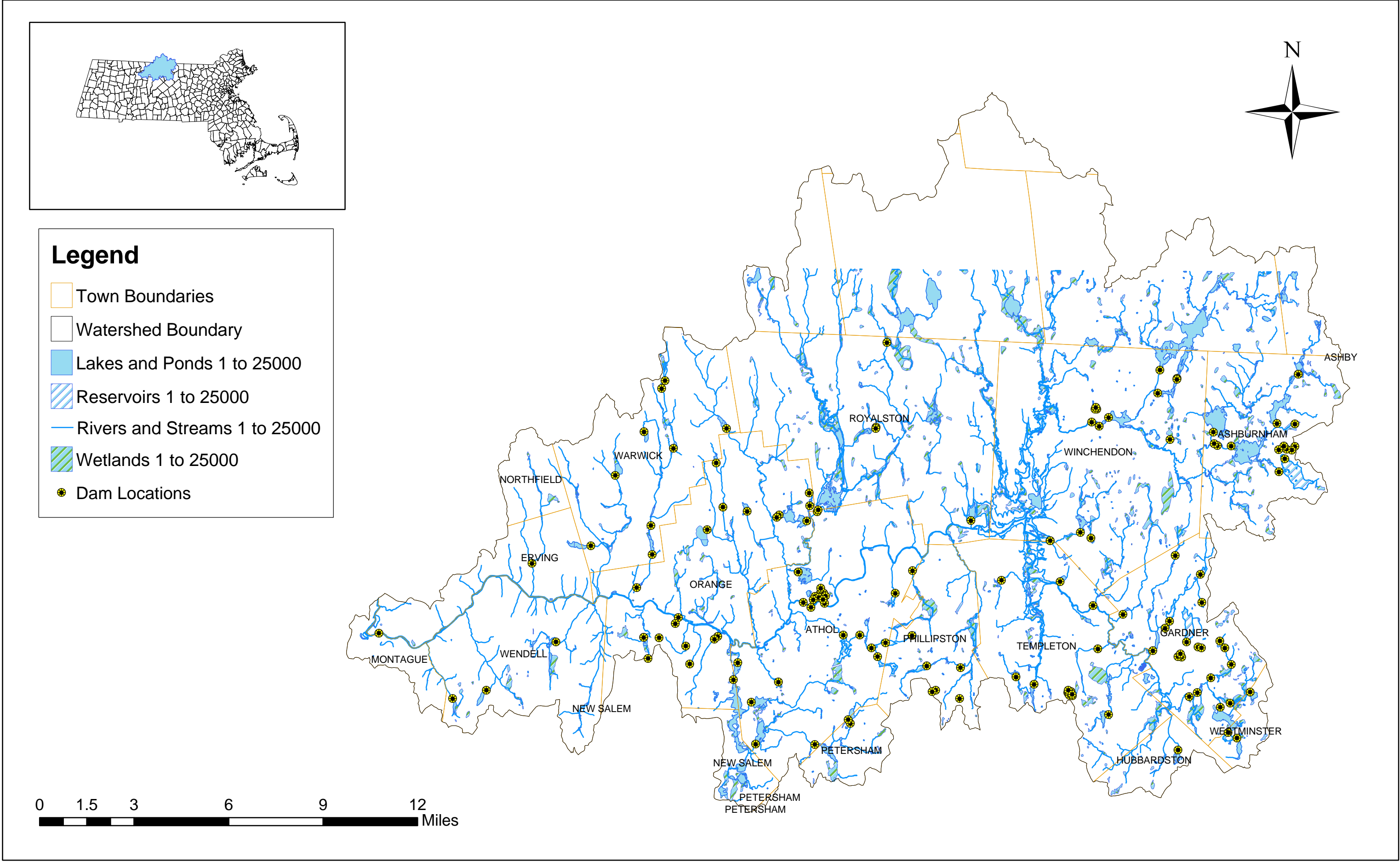
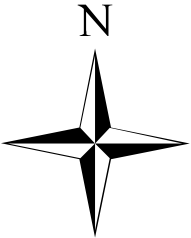
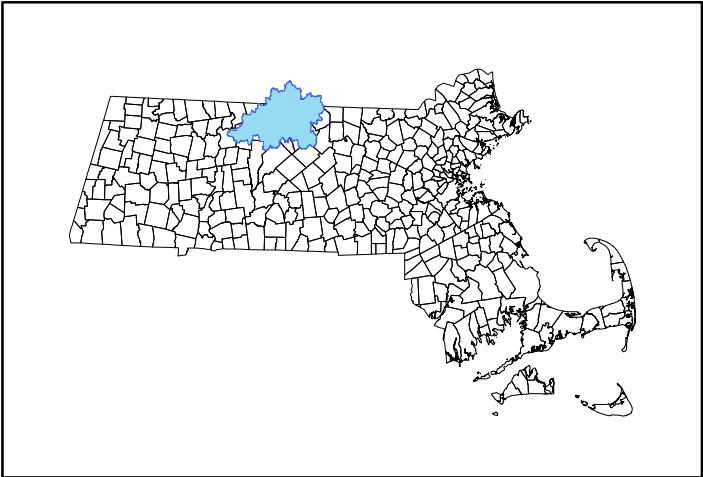
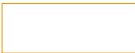




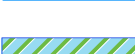

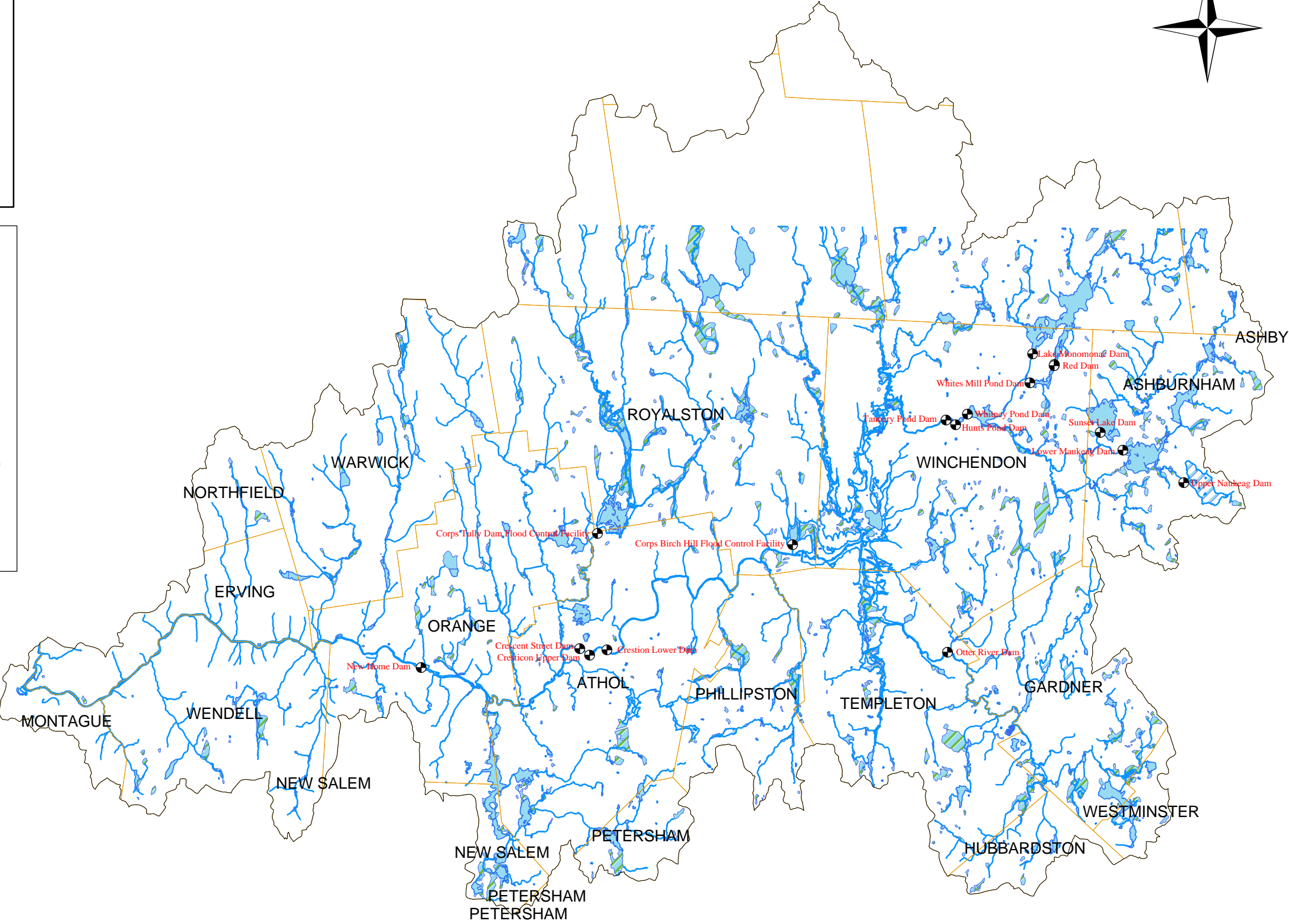


Figure 3.1-1: Major Dams in the Millers River Basin



**Legend**

-  Town Boundaries
-  Watershed Boundary
-  Lakes and Ponds 1 to 25000
-  Reservoirs 1 to 25000
-  Rivers and Streams 1 to 25000
-  Wetlands 1 to 25000
-  Major Dam Locations





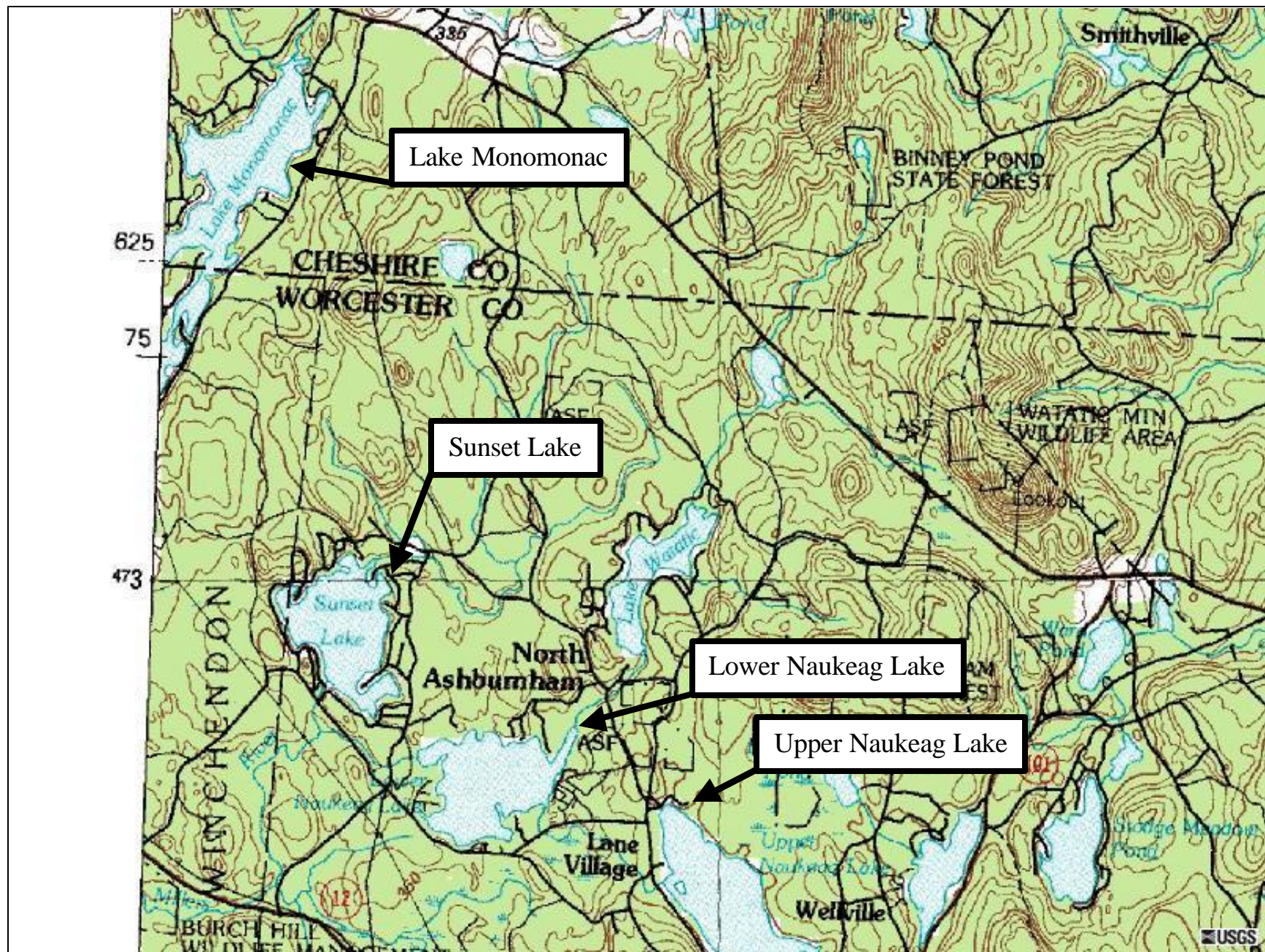


FIGURE 3.1.1.1-1 Lake Monomonac, Upper Naukeag Lake, Lower Naukeag Lake & Sunset Lake



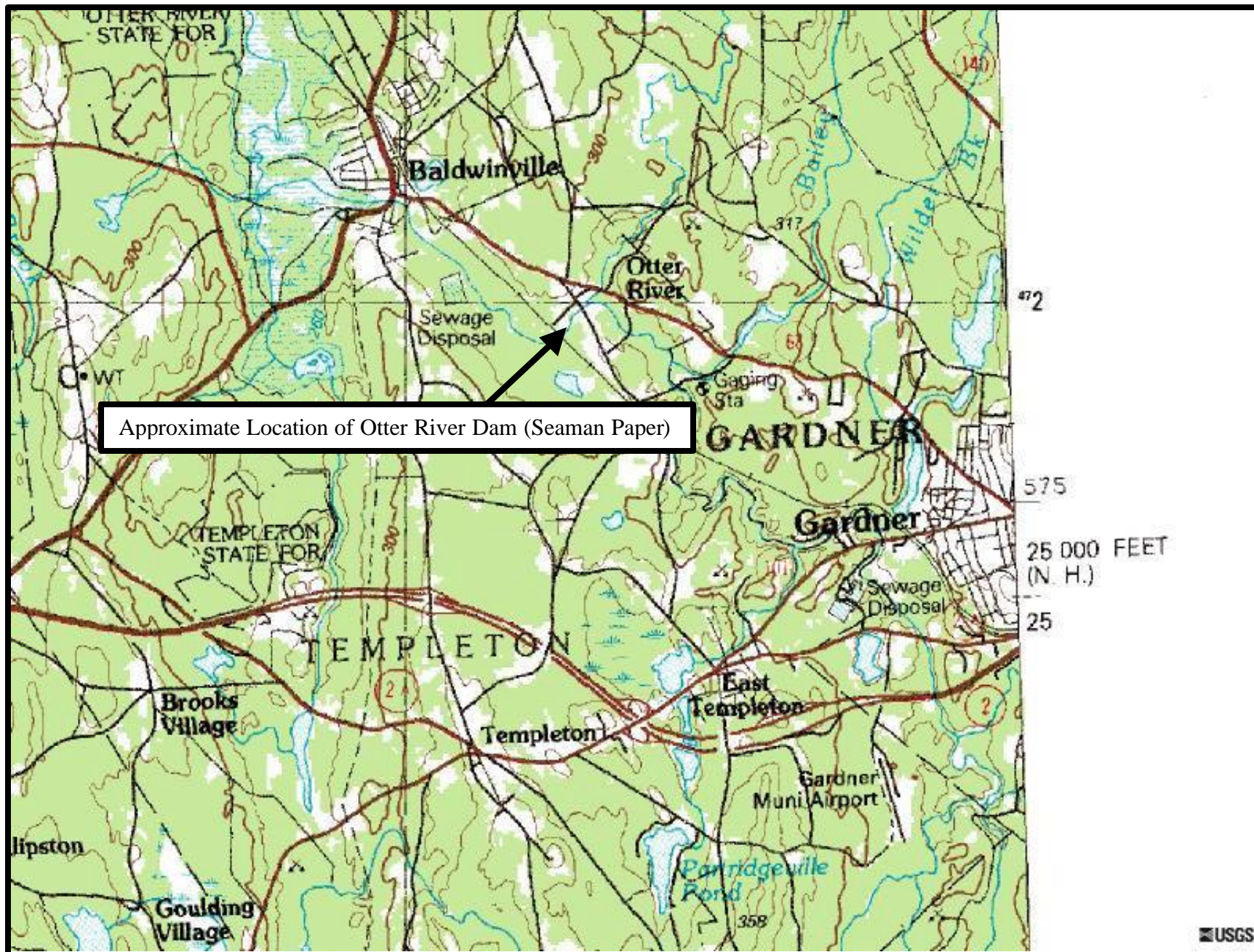


FIGURE 3.1.3.1-1 Otter River Dam (Seaman Paper)





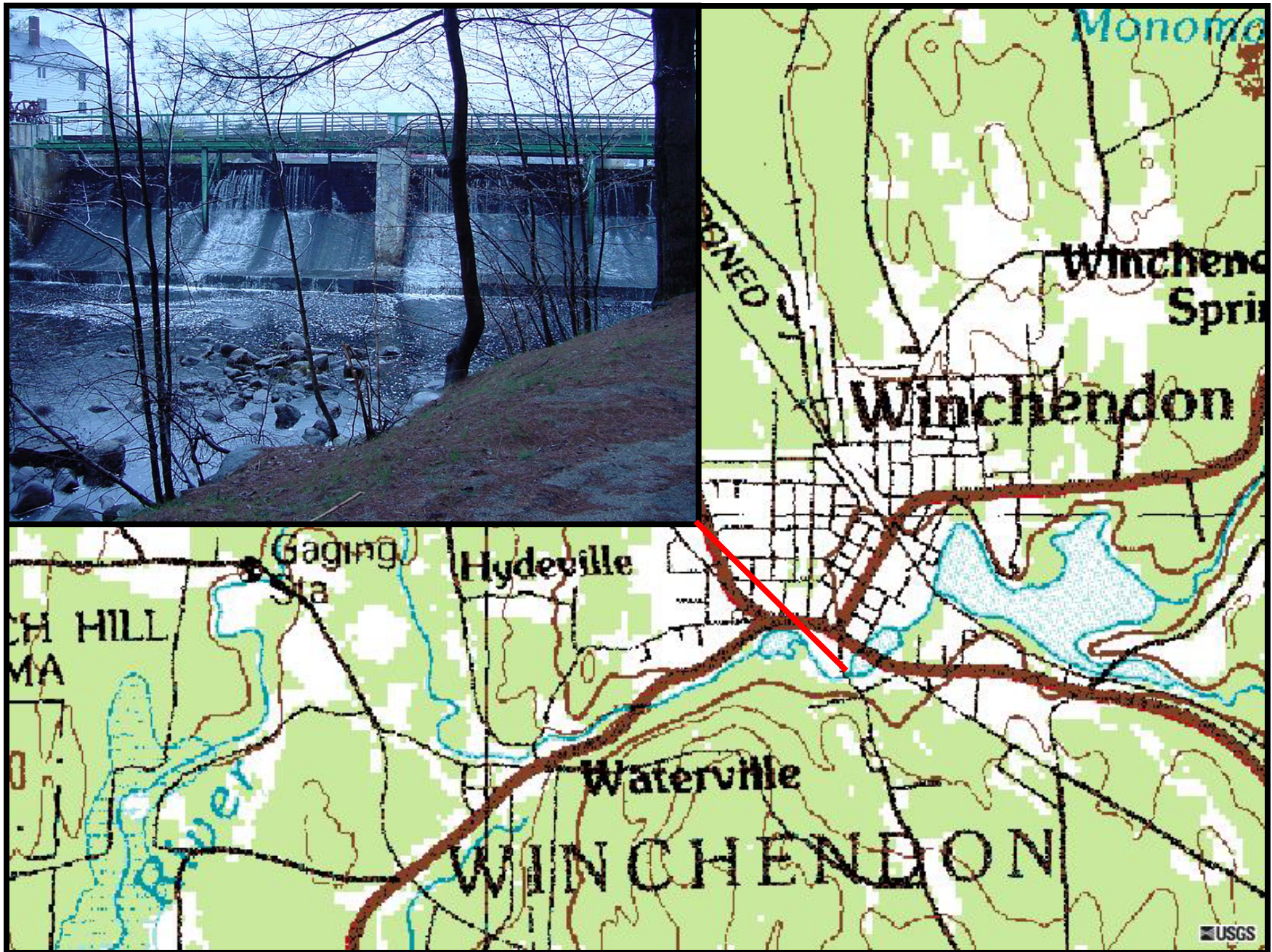
FIGURE 3.1.4.1-1: Picture of Tully Lake Dam and Surrounding Topography





FIGURE 3.1.5.2-1: Picture of Whitney Pond Dam and Surrounding Topography





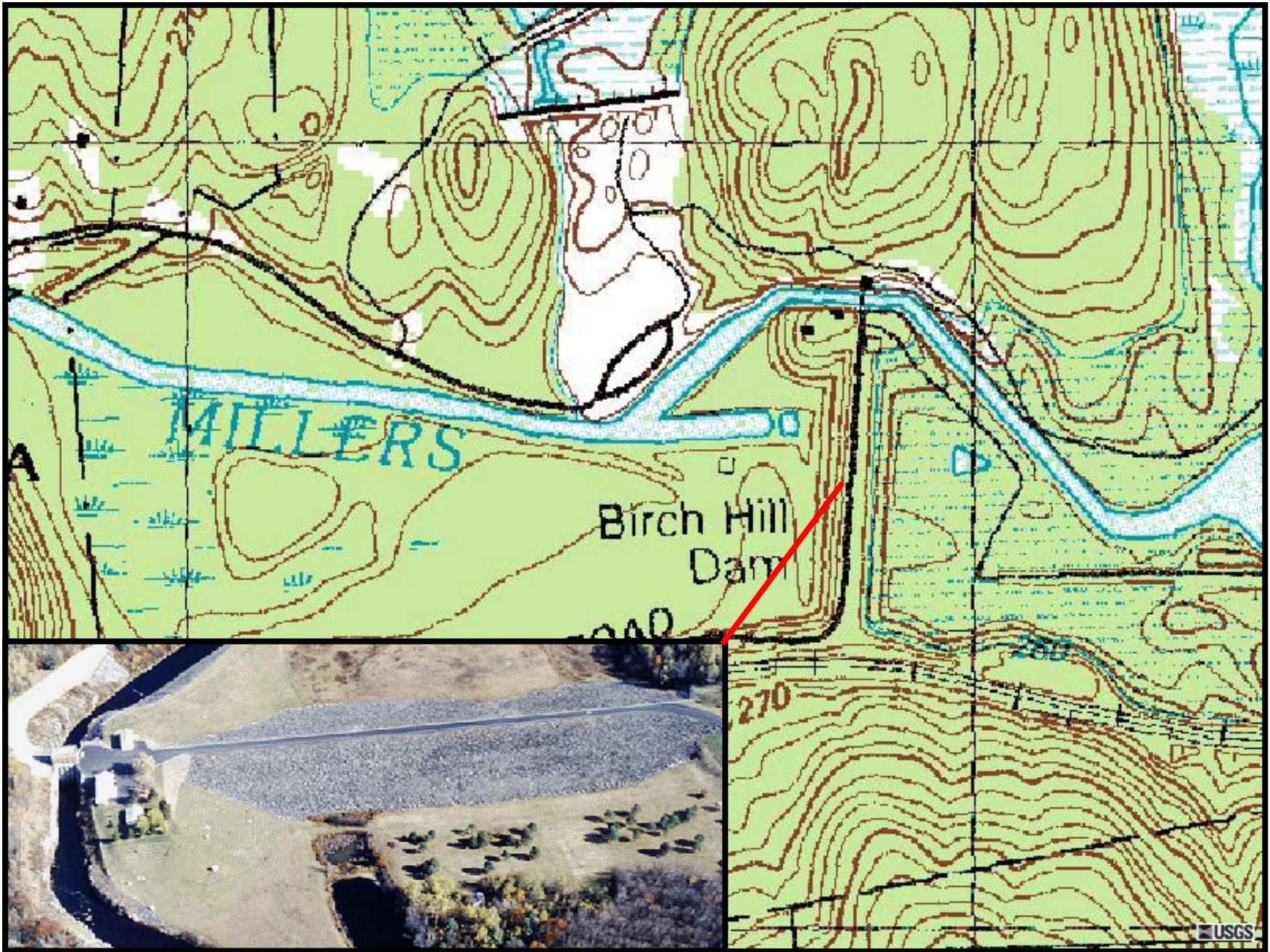
**FIGURE 3.1.5.3-1: Picture of Hunts Pond Dam and Surrounding Topography**





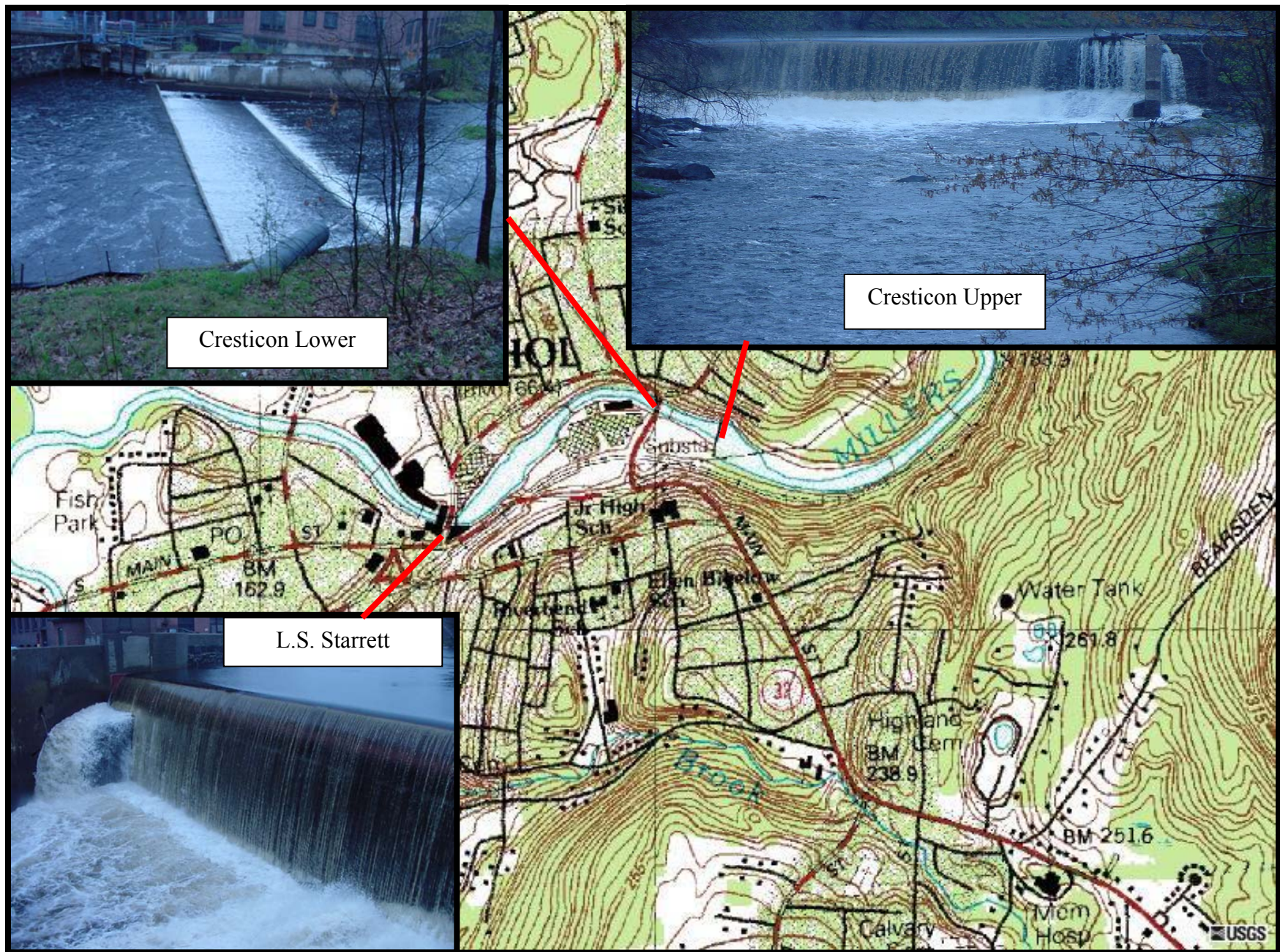
FIGURE 3.1.5.4-1: Picture of Tannery Pond Dam and Surrounding Topography





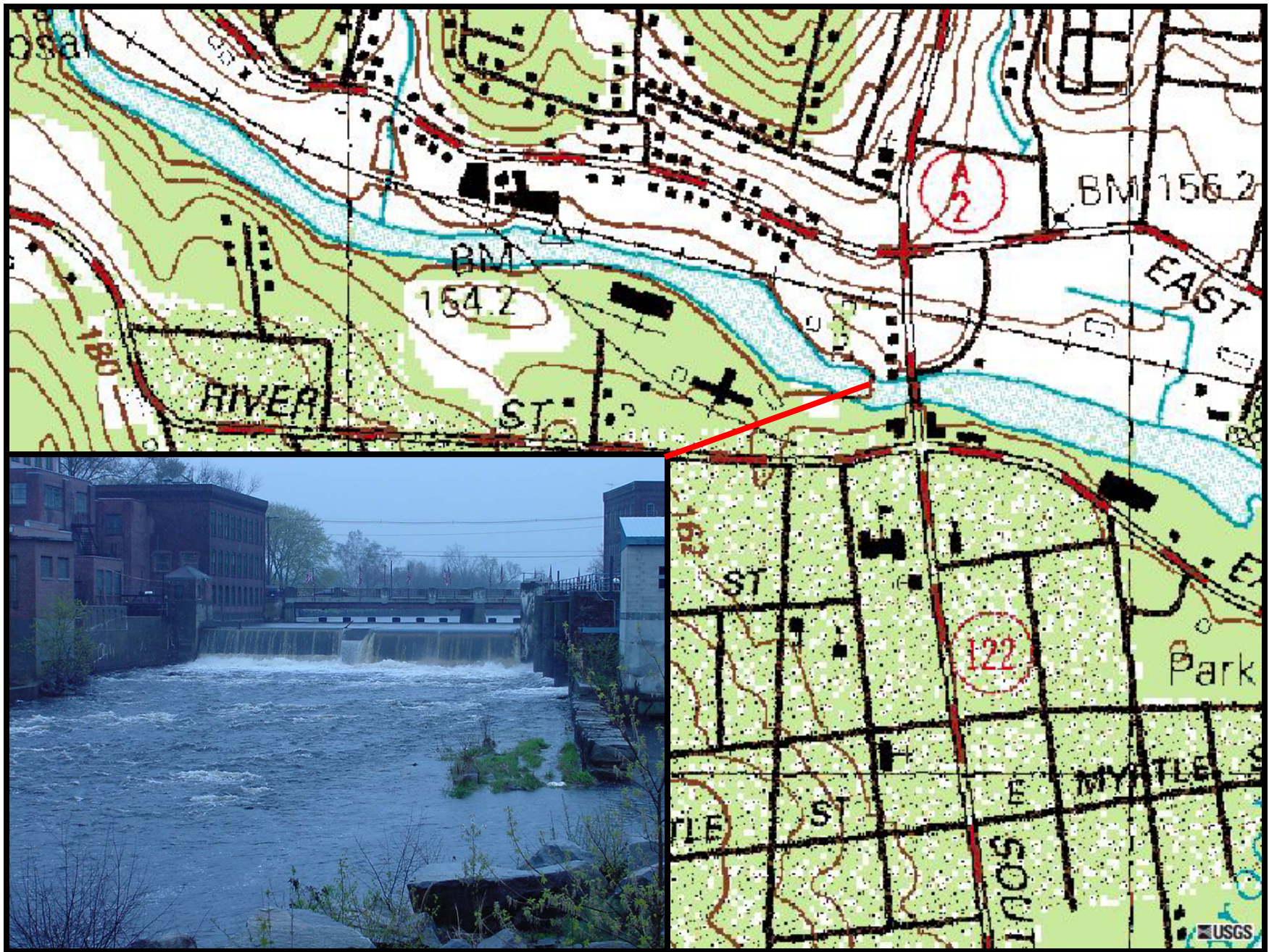
**FIGURE 3.1.5.5-1: Birch Hill Dam and Surrounding Topography**





**FIGURE 3.1.5.6-1: Pictures of Cresticon Upper, Cresticon Lower & L.S. Starrett Dams & Surrounding Topography**





**FIGURE 3.1.5.8-1: Picture of New Home Dam and Surrounding Topography**

## **SECTION 4.0: FIGURES AND TABLES**



Figure 4.0-1: Location of Registered and Permitted Water Withdrawals in the Millers River Basin

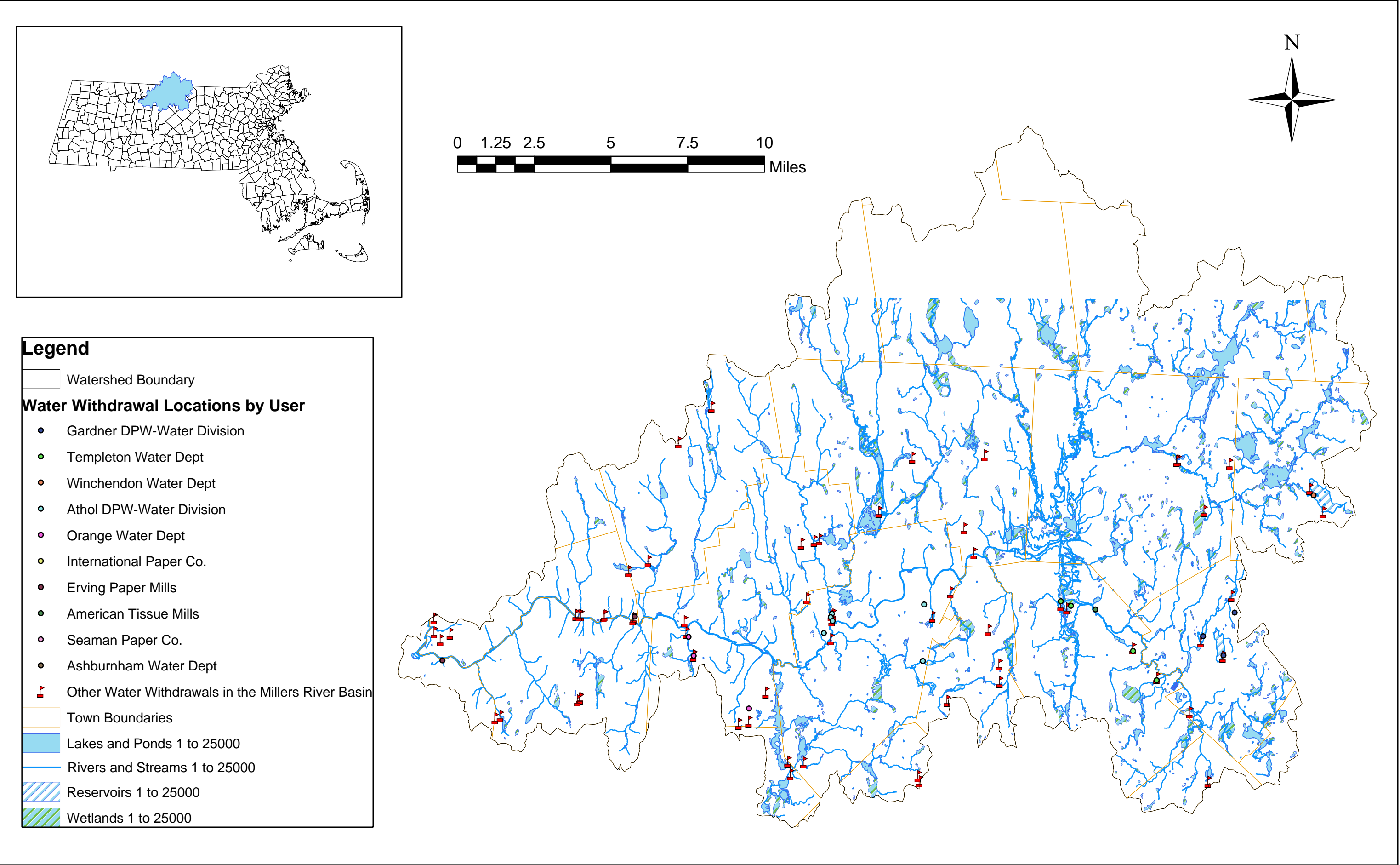
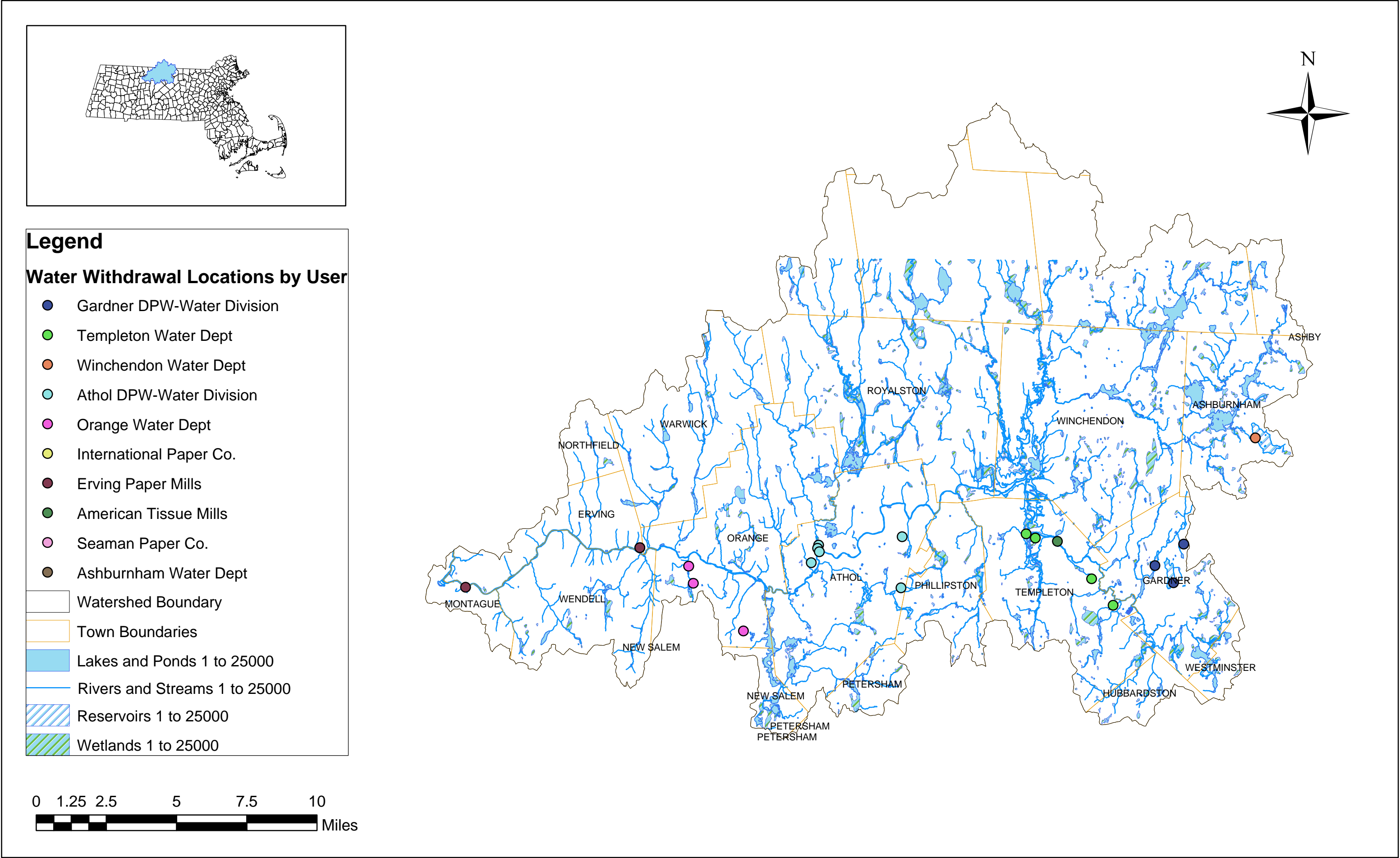
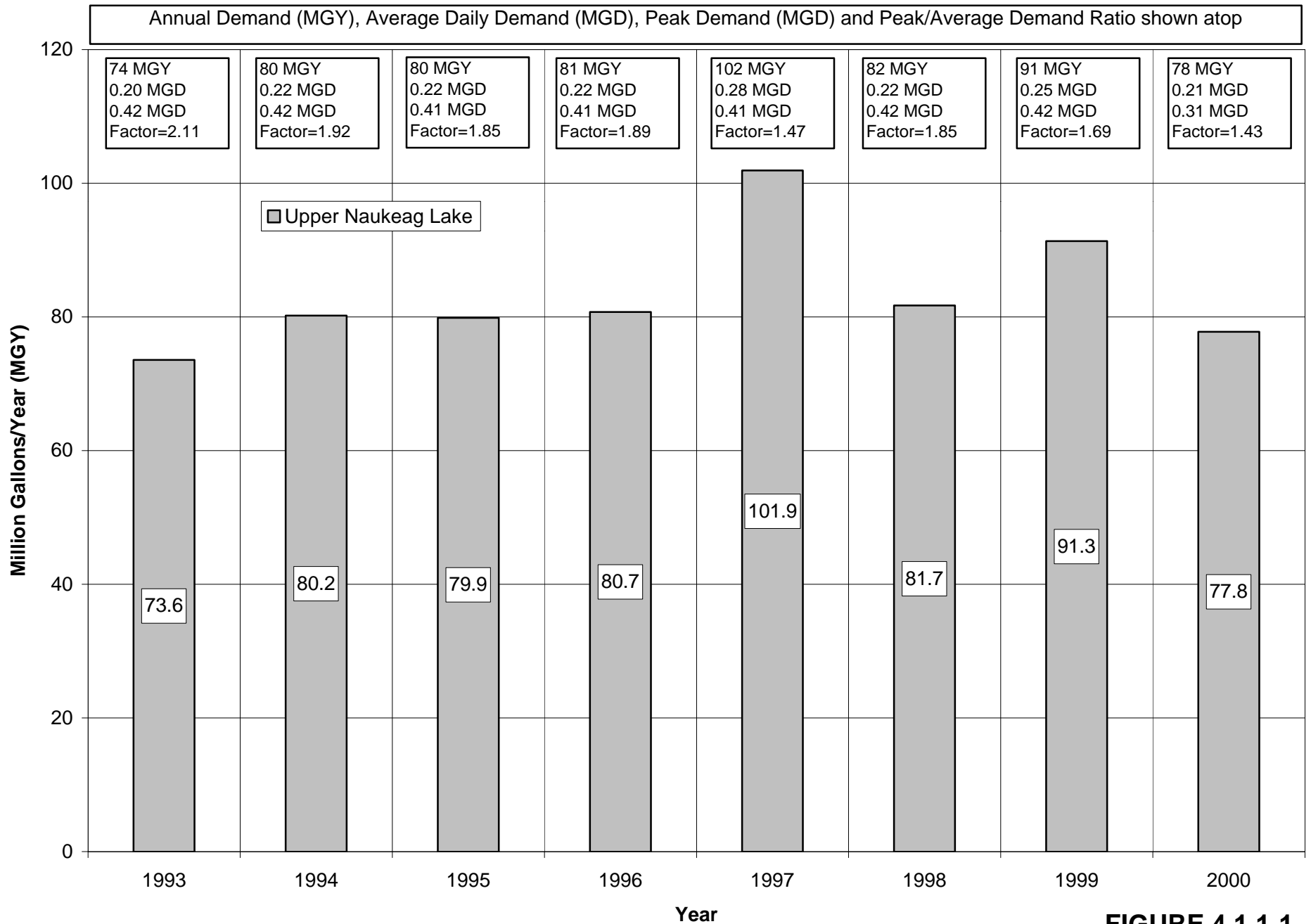




Figure 4.0-2: Location of Water Withdrawals >100,000 GPD in the Millers River Basin

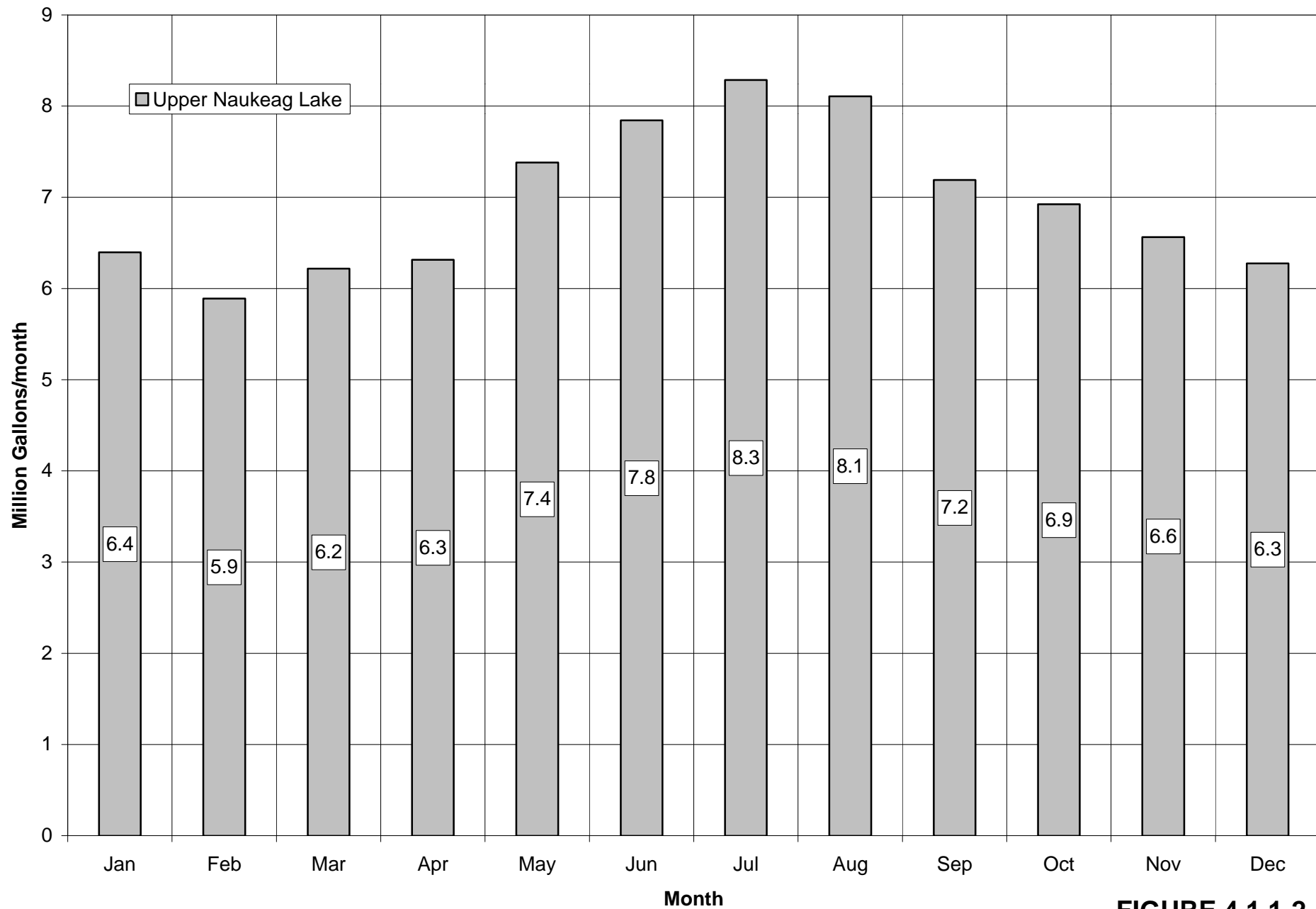


## Ashburnham Water Department: Summary of Water Usage and Sources from 1993-2000



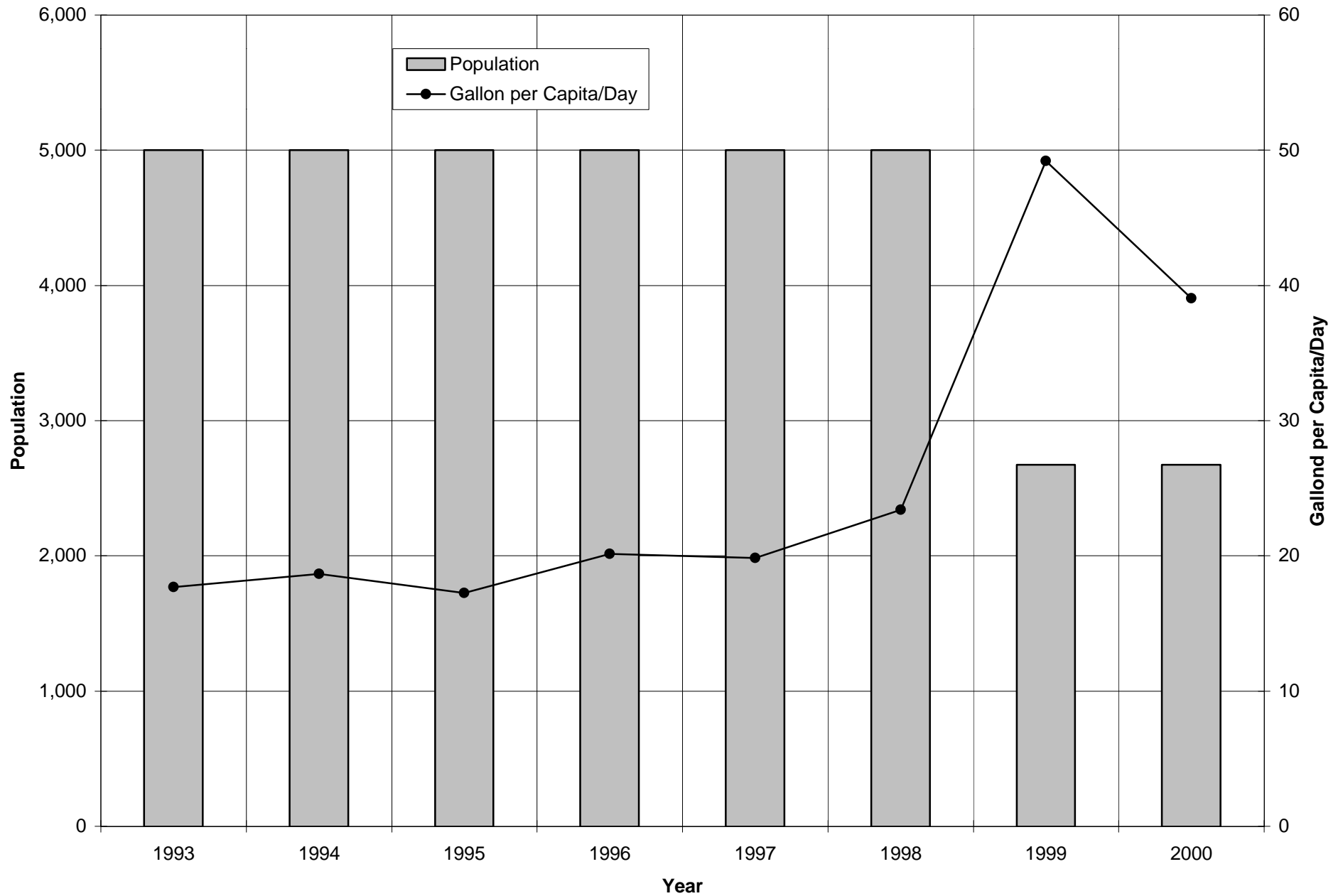
**FIGURE 4.1.1-1**

**Ashburnham Water Department: Summary of Monthly Water Sources Used to Meet Demand on a Monthly Basis-Averages Based on Period 1993-2000**



**FIGURE 4.1.1-2**

**Ashburnham Water Department: Population Served Throughout the Year and Average  
Daily Gallons per Capita Day (gpcd)**



**FIGURE 4.1.4-1**

## Winchendon Water Department: Summary of Water Usage and Sources from 1993-2000

Annual Demand (MGY), Average Daily Demand (MGD), Peak Demand (MGD) and Peak/Average Demand Ratio shown atop

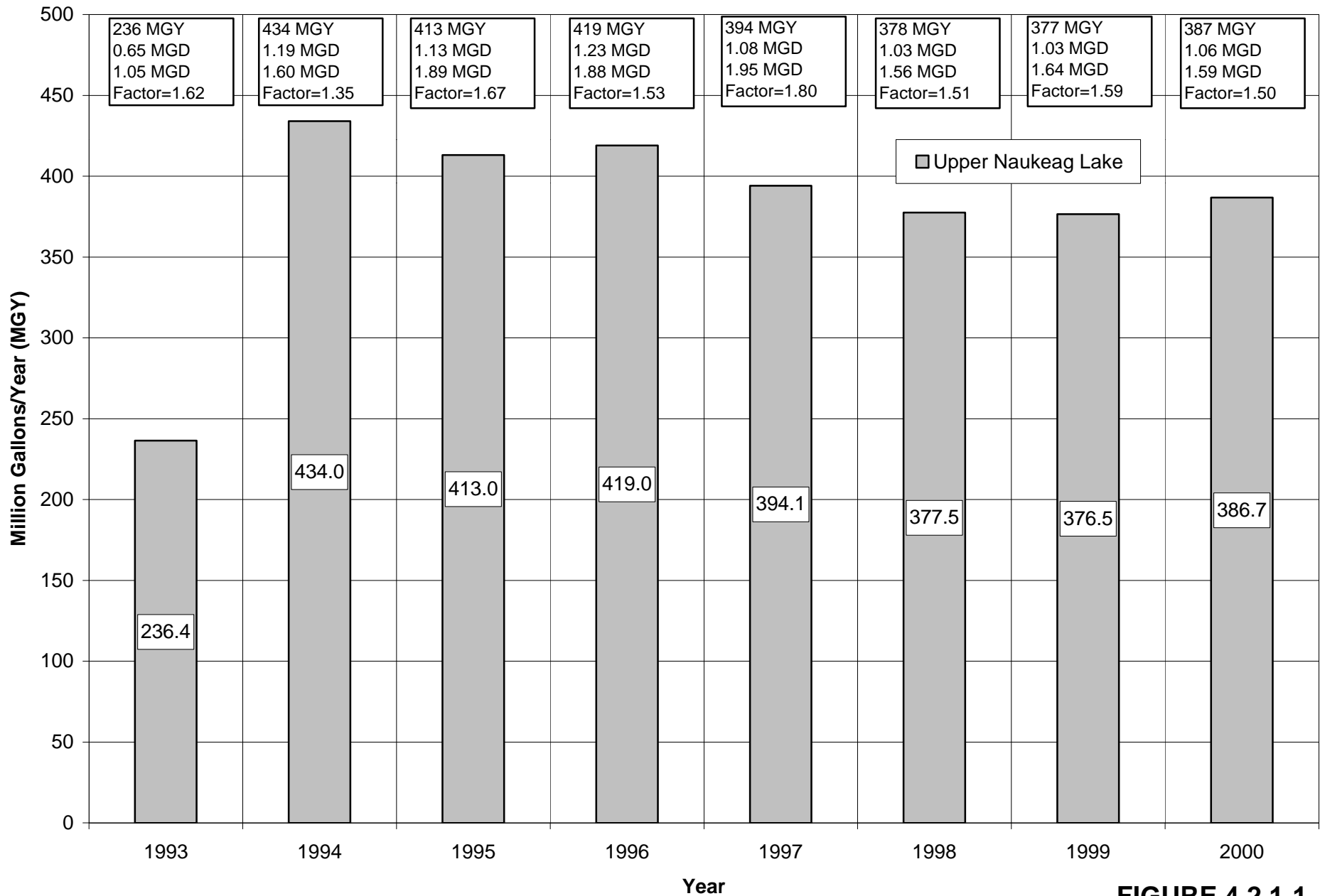
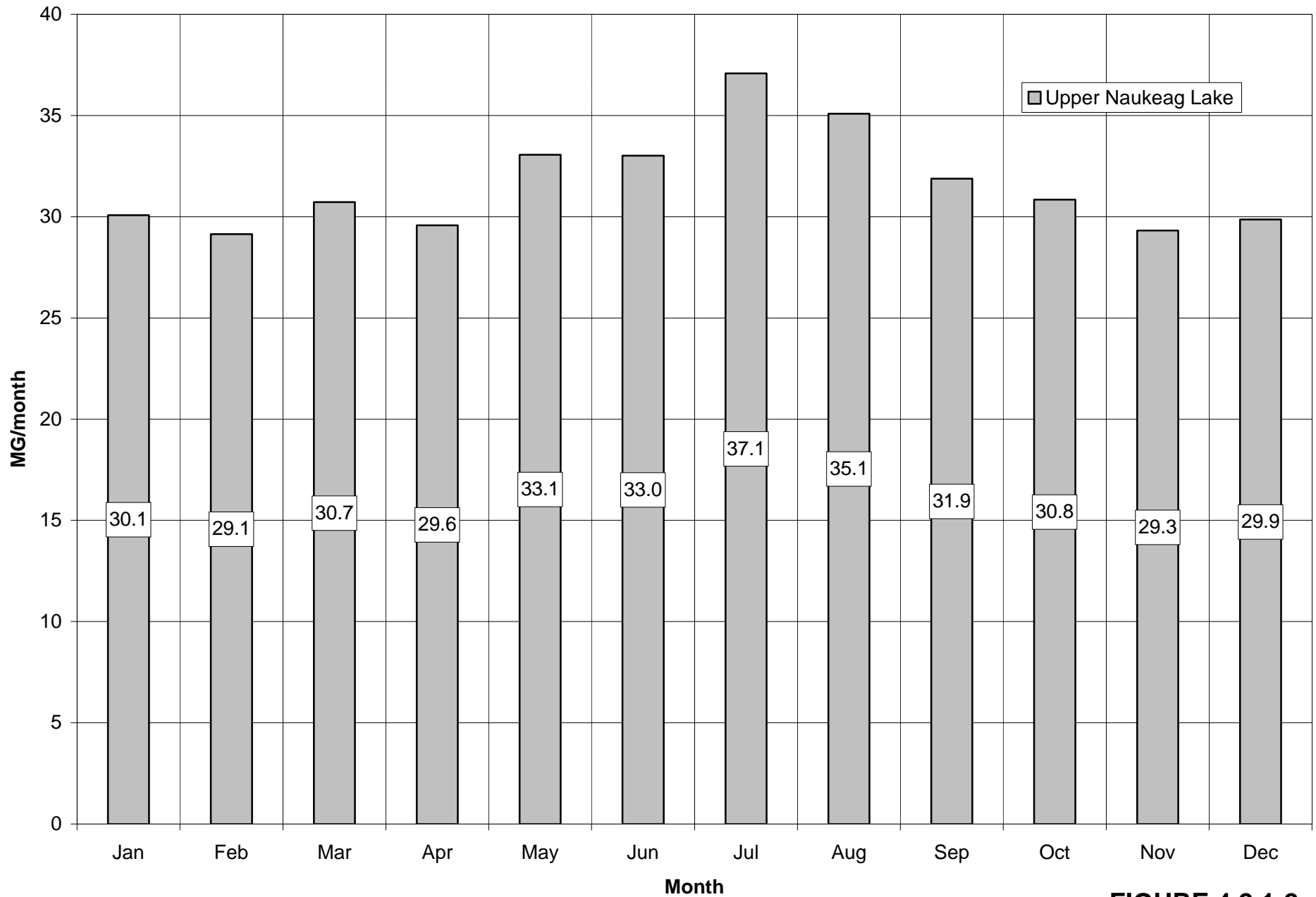


FIGURE 4.2.1-1

**Winchendon Water Department: Summary of Monthly Water Sources Used to Meet Demand on a Monthly Basis-Averages Based on Period 1993-2000**

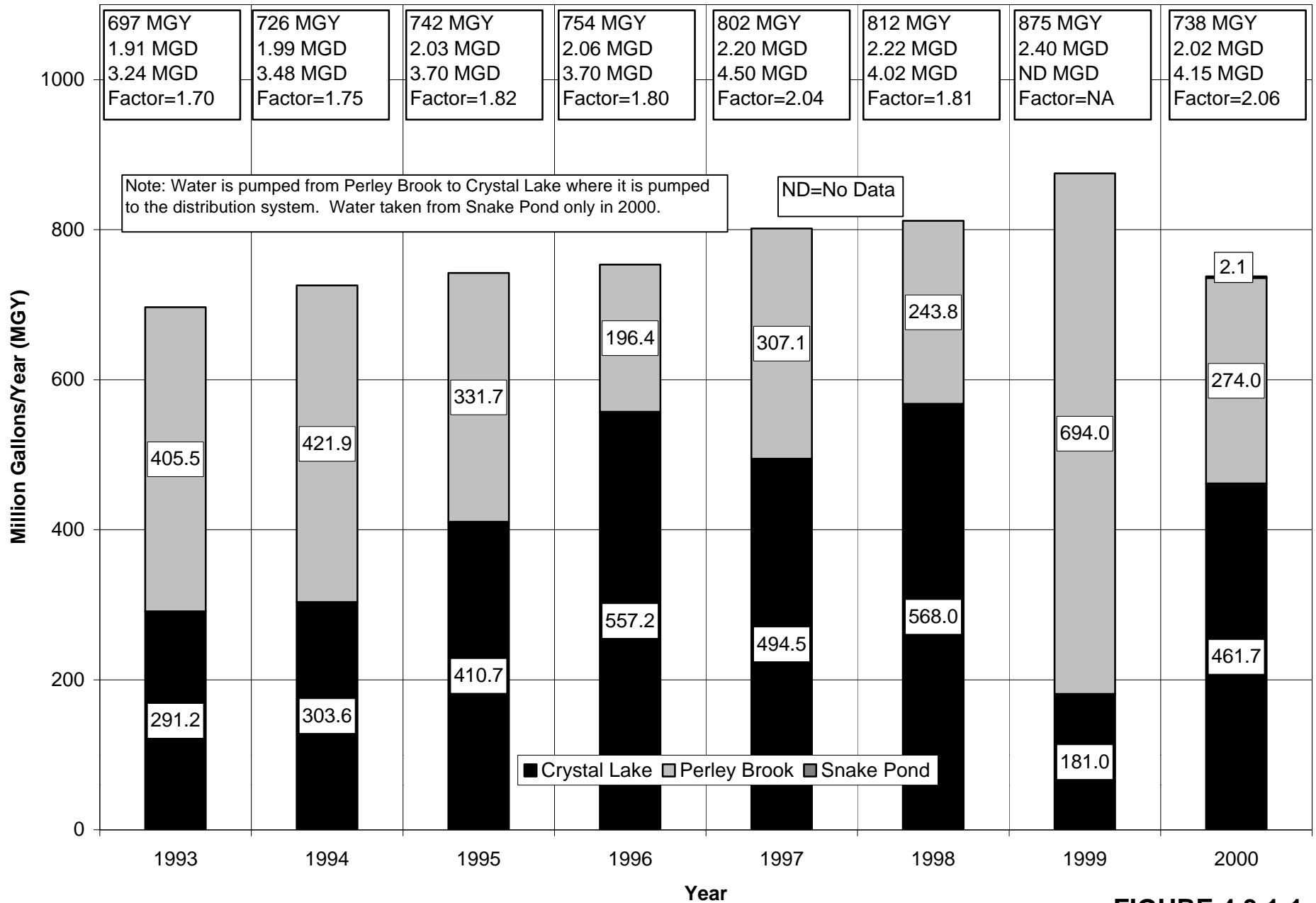


**FIGURE 4.2.1-2**



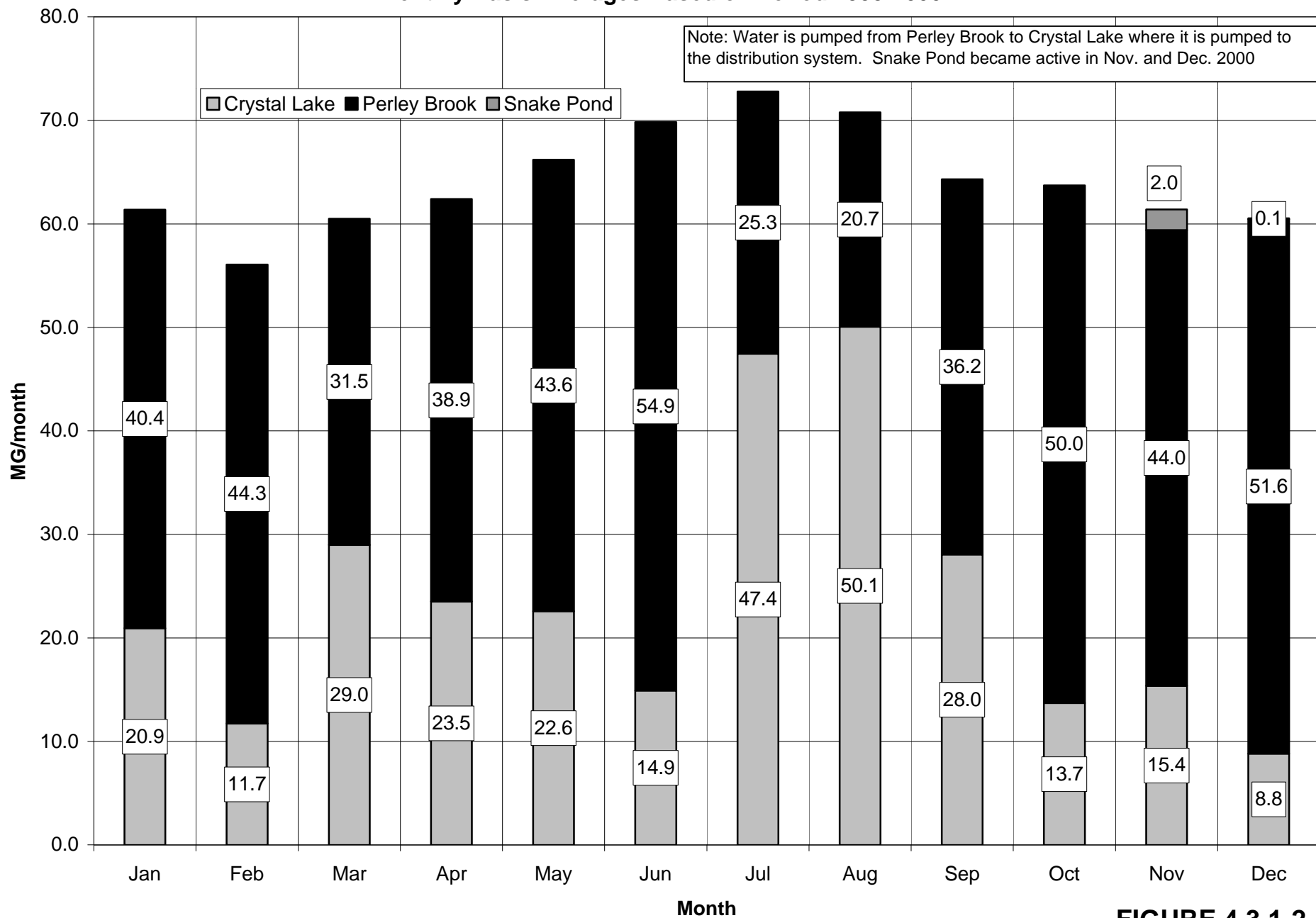
## Gardner DPW Water Division: Summary of Water Usage and Sources from 1993-2000

Annual Demand (MGY), Average Daily Demand (MGD), Peak Demand (MGD) and Peak/Average Demand Ratio



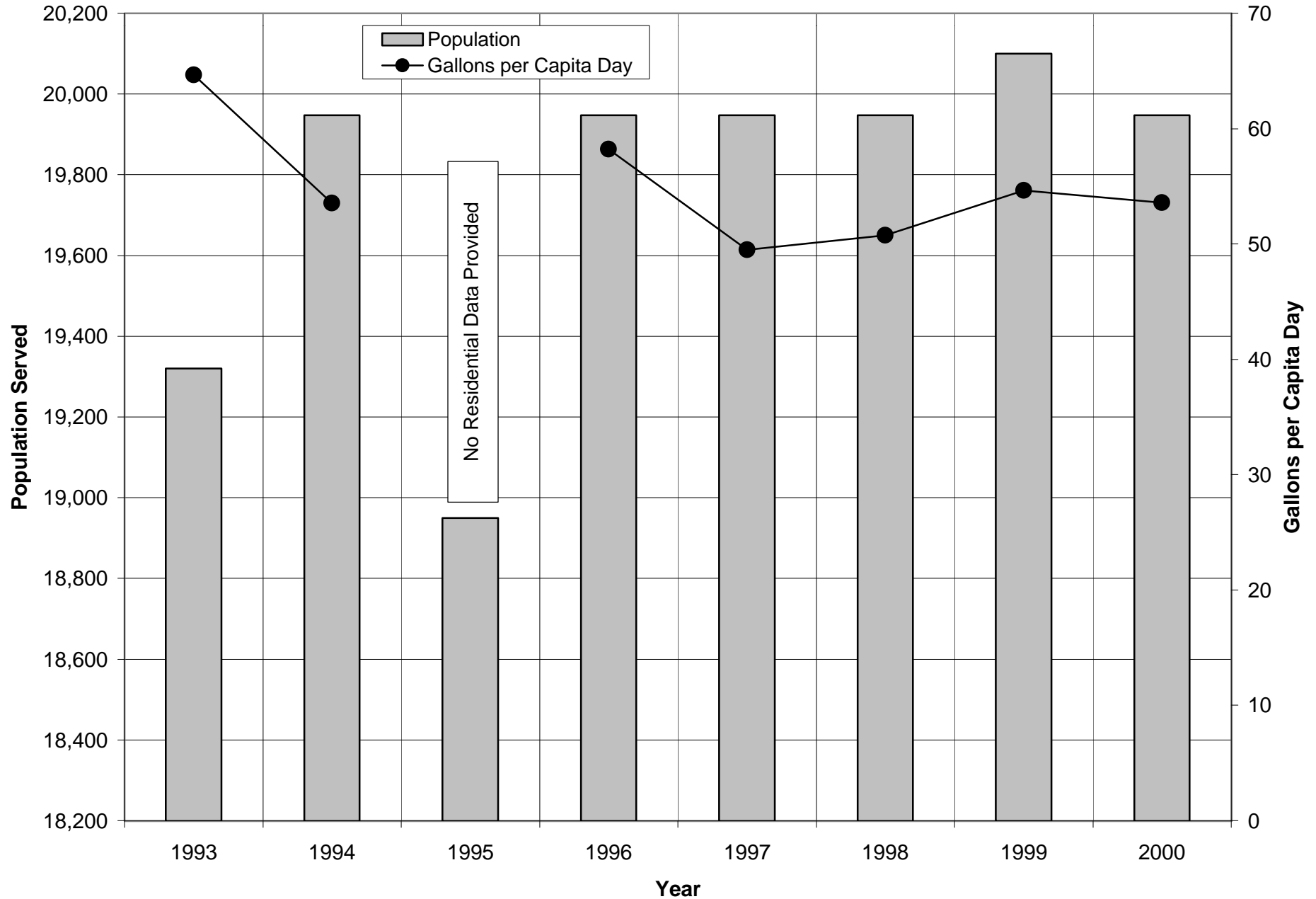
**FIGURE 4.3.1-1**

# **Gardner DPW Water Division: Summary of Monthly Water Sources Used to Meet Demand on a Monthly Basis-Averages Based on Period 1993-2000**



**FIGURE 4.3.1-2**

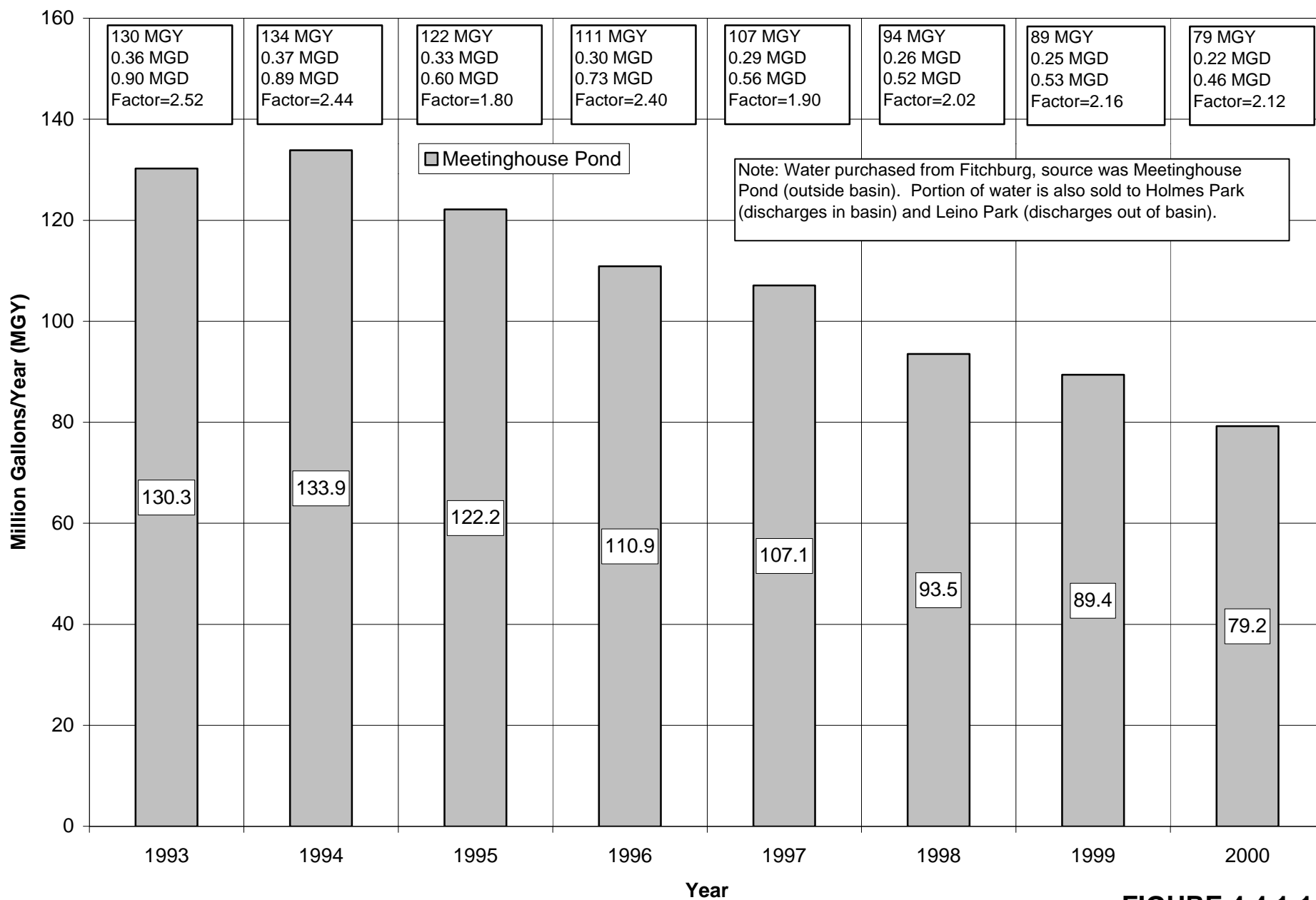
**Gardner DPW Water Division- Population Served Throughout the Year and Average Daily Gallons per Capita Day (gpcd)**



**FIGURE 4.3.4-1**

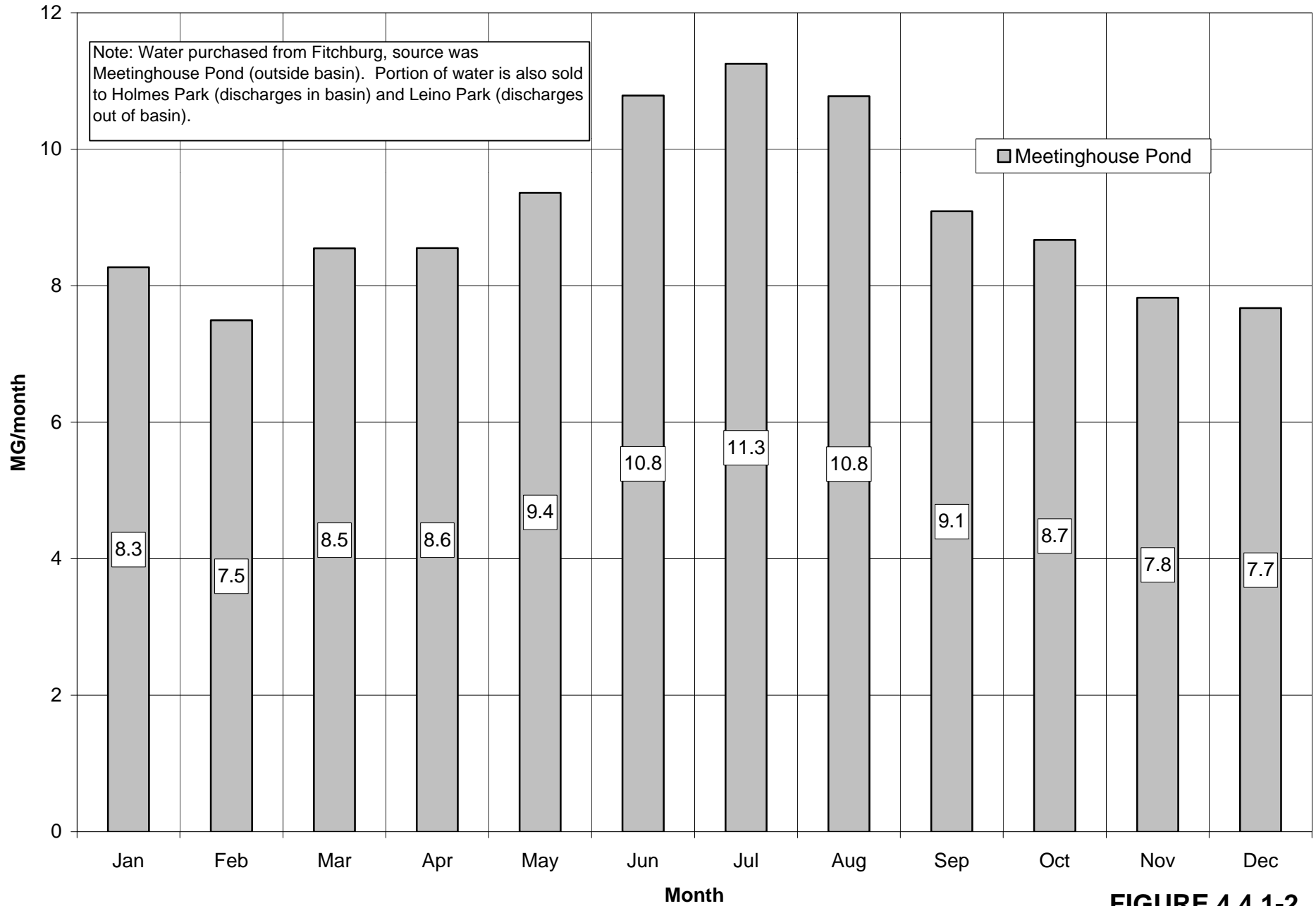
## Westminster Water Department: Summary of Water Usage and Sources from 1993-2000

Annual Demand (MGY), Average Daily Demand (MGD), Peak Demand (MGD) and Peak/Average Demand Ratio shown atop



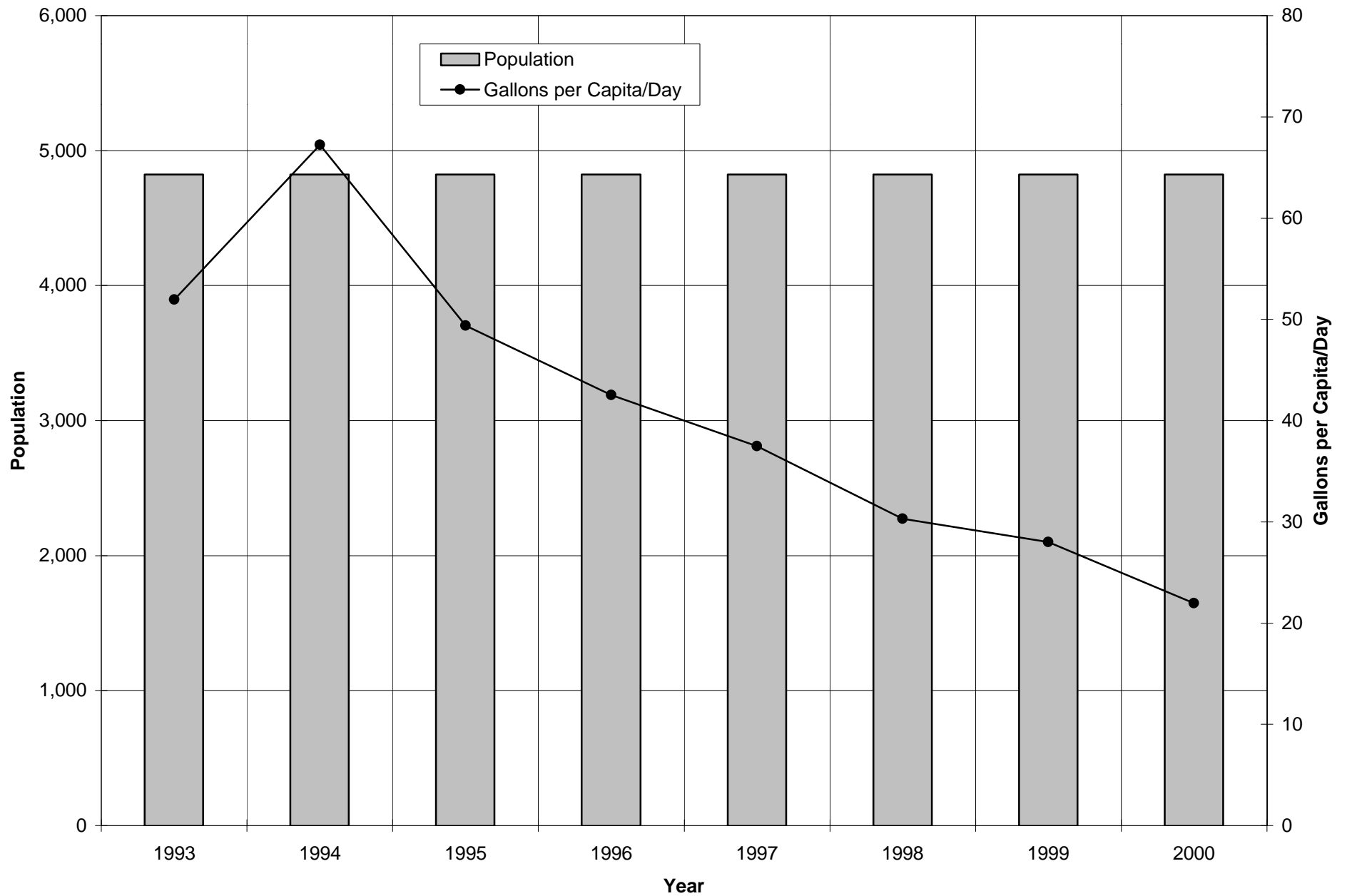
**FIGURE 4.4.1-1**

**Westminster Water Department: Summary of Water Sources Used to Meet Demand on a  
Monthly Basis-Averages Based on Period 1993-2000**



**FIGURE 4.4.1-2**

**Westminster Water Division - Population Served Throughout the Year and Average Daily Gallons per Capita Day (gpcd)**

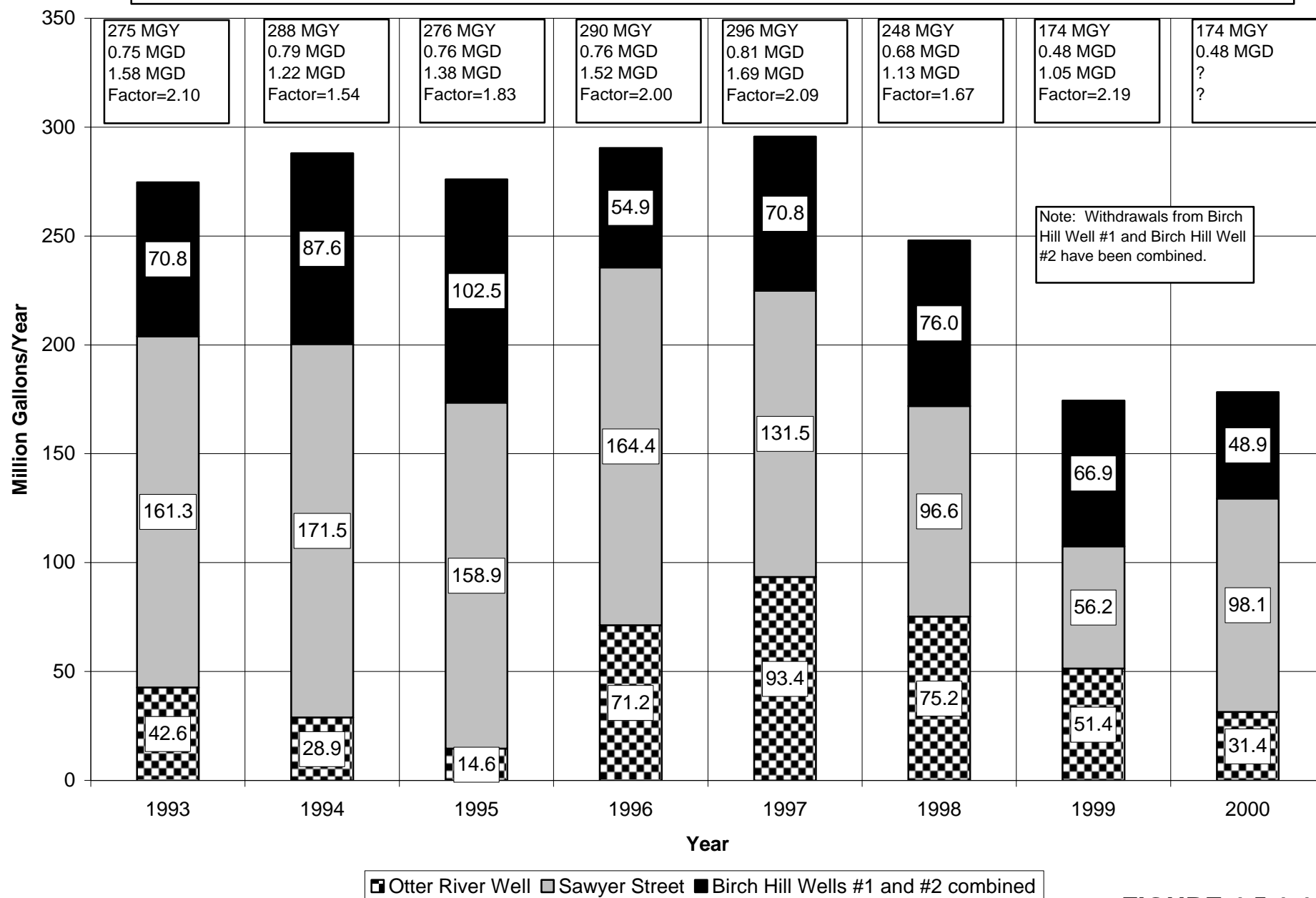


**FIGURE 4.4.4-1**



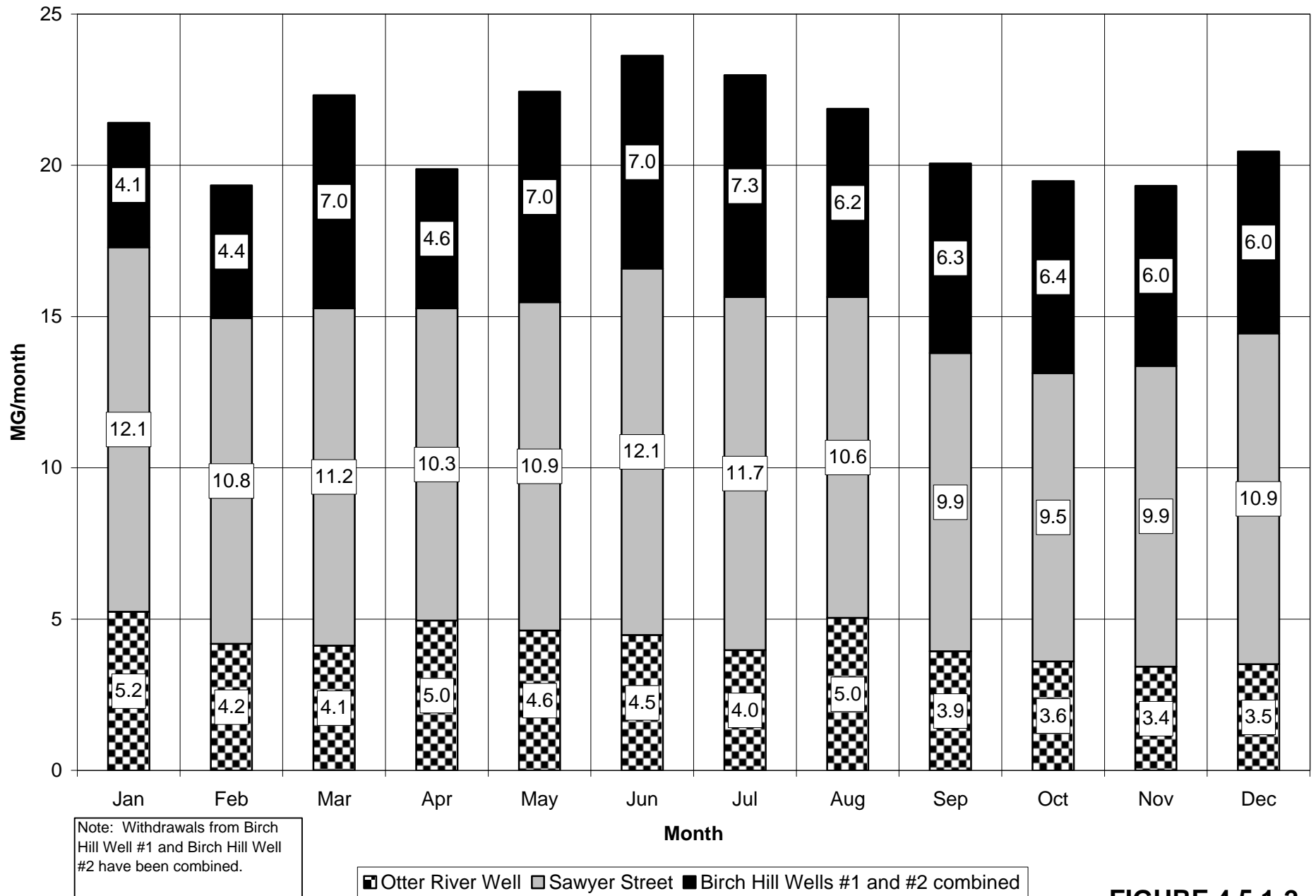
## Templeton Water Department: Summary of Water Usage and Sources from 1993 - 2000

Annual Demand (MGY), Average Daily Demand (MGD), Peak Demand (MGD) and Peak/Average Demand Ratio shown atop



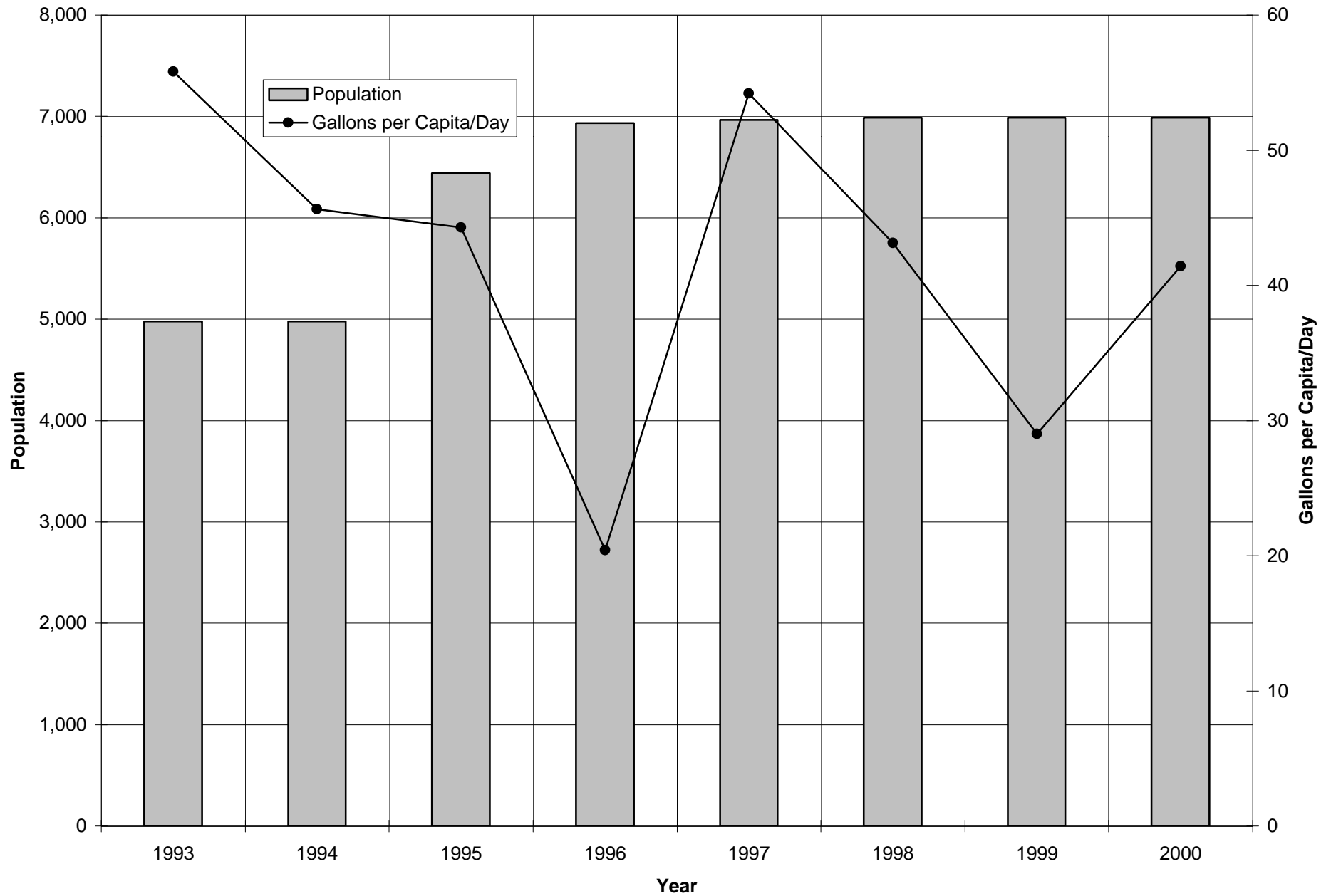
**FIGURE 4.5.1-1**

**Templeton Water Department: Summary of Monthly Water Sources Used to Meet Demand on a Monthly Basis-Averages Based on Period 1993-2000**



**FIGURE 4.5.1-2**

**Templeton Water Department- Population Served Throughout the Year and Average Daily Gallons per Capita Day (gpcd)**



**FIGURE 4.5.4-1**

# Seaman Paper: Summary of Water Usage and Sources from 1993-1999

Annual Demand (MGY), Average Daily Demand (MGD), Peak Demand (MGD) and Peak/Average Demand Ratio

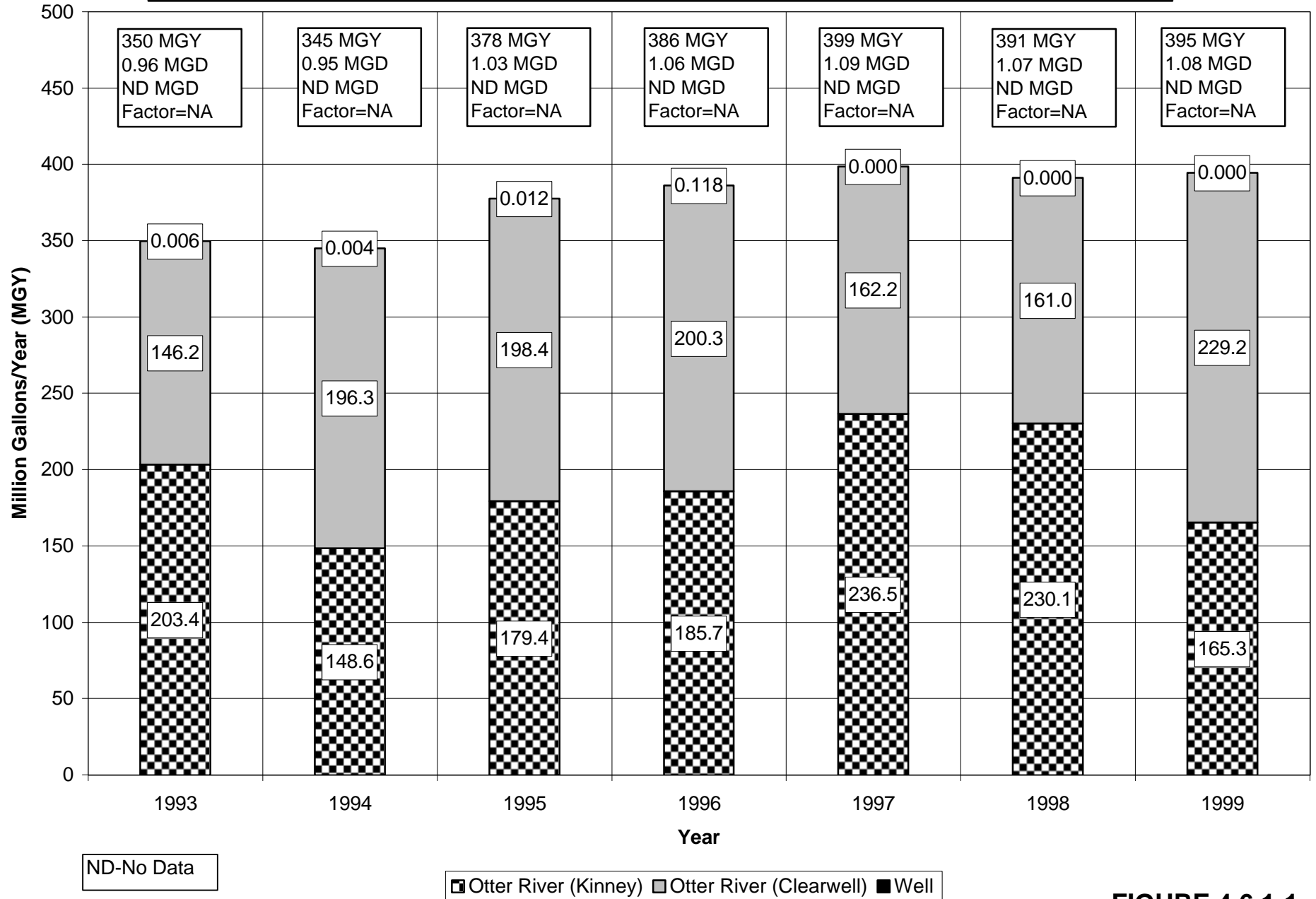
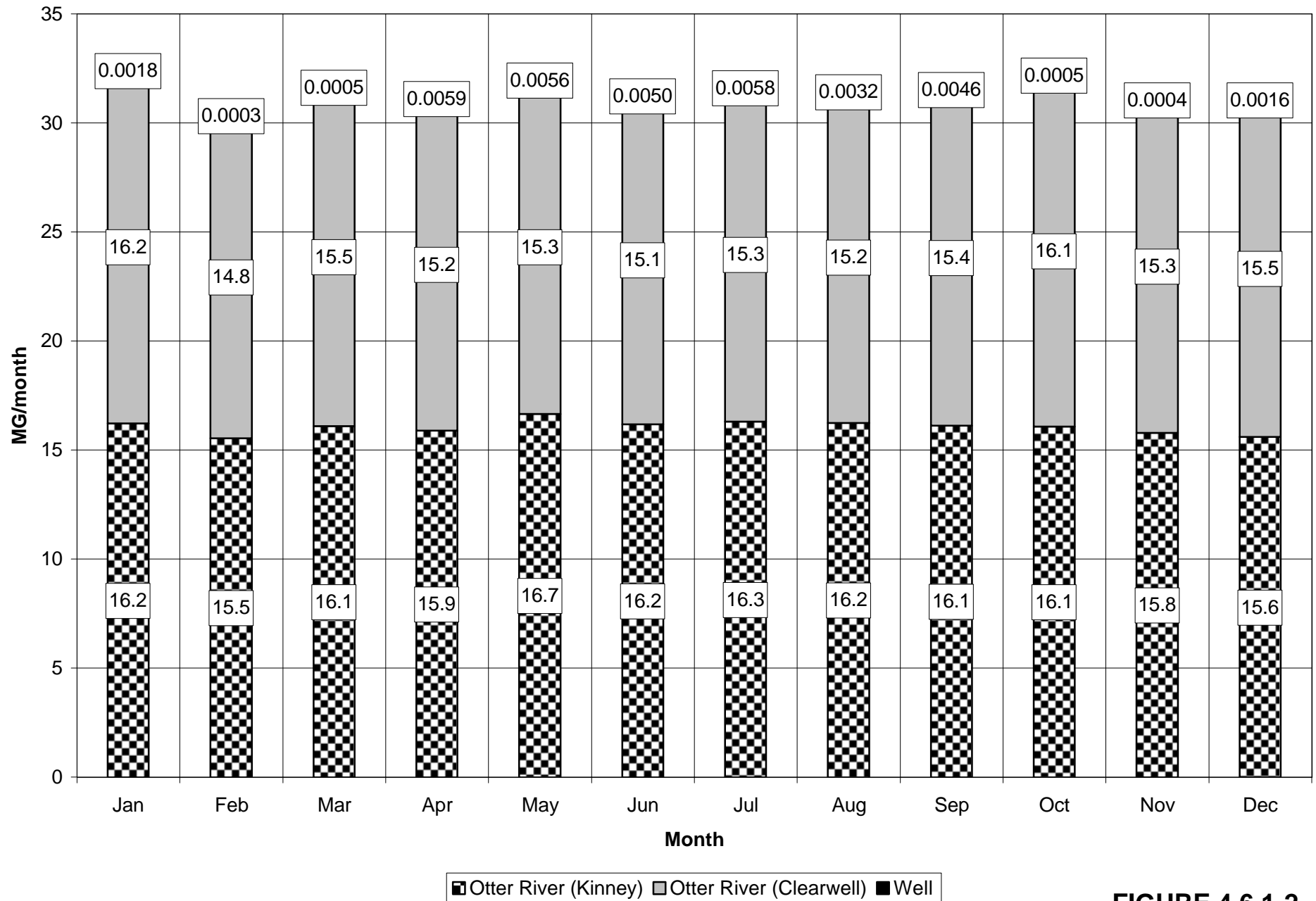


FIGURE 4.6.1-1



**Seaman Paper: Summary of Monthly Water Sources Used to Meet Demand on a Monthly Basis-  
Averages Based on Period 1993-1999**



**FIGURE 4.6.1-2**

### American Tissue Mills: Summary of Water Usage and Sources from 1994-1995

Annual Demand (MGY), Average Daily Demand (MGD), Peak Demand (MGD) and Peak/Average Demand Ratio shown

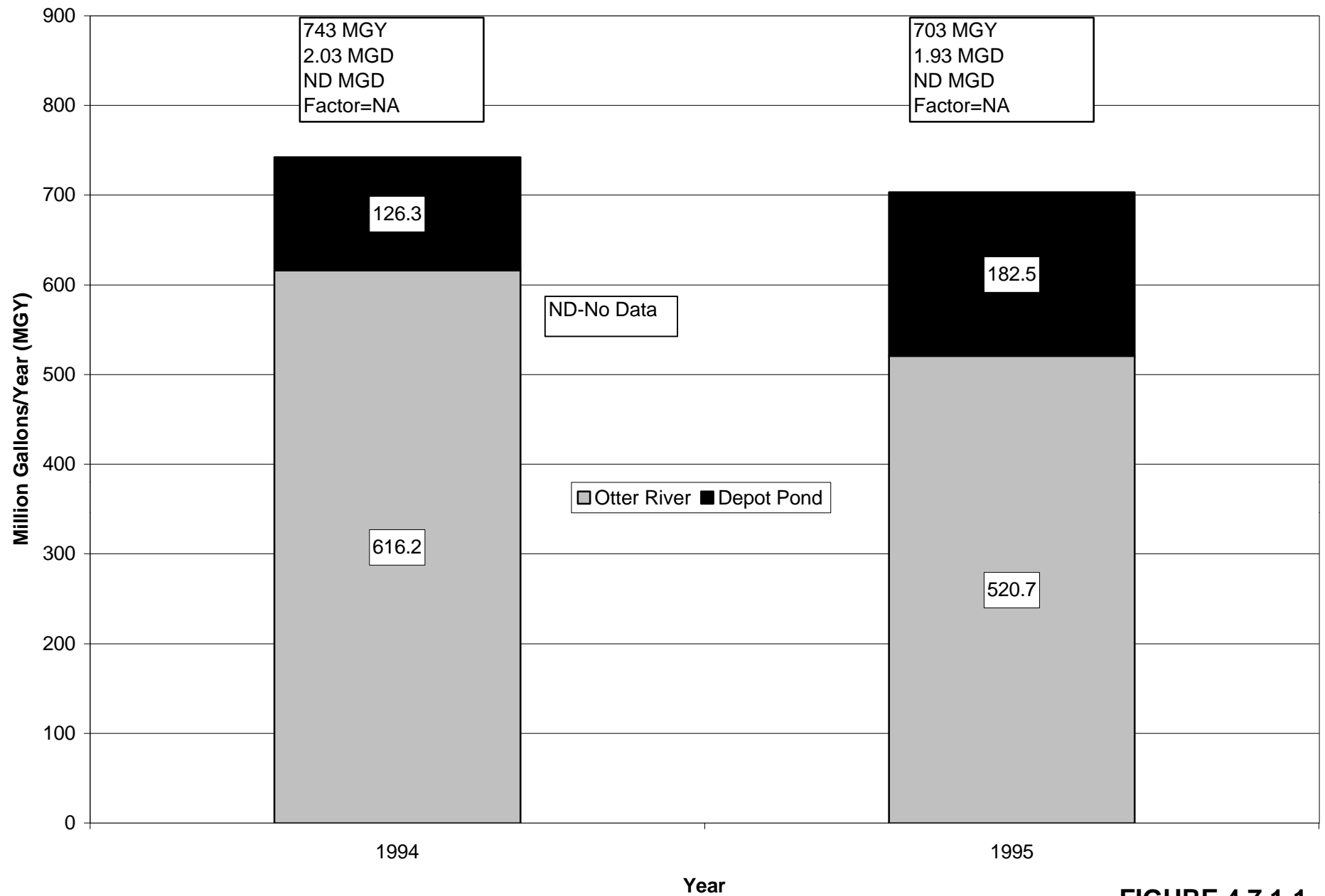
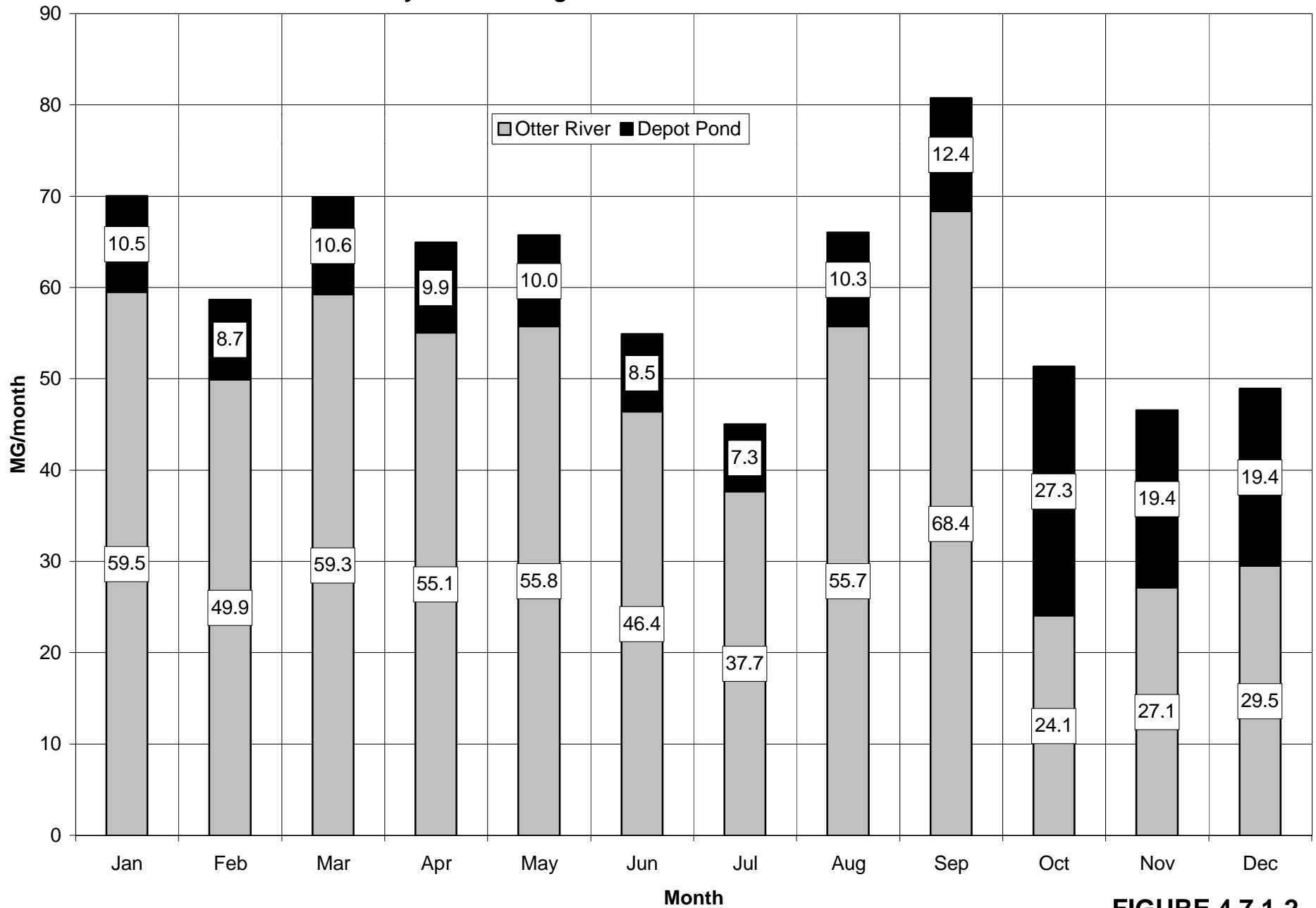


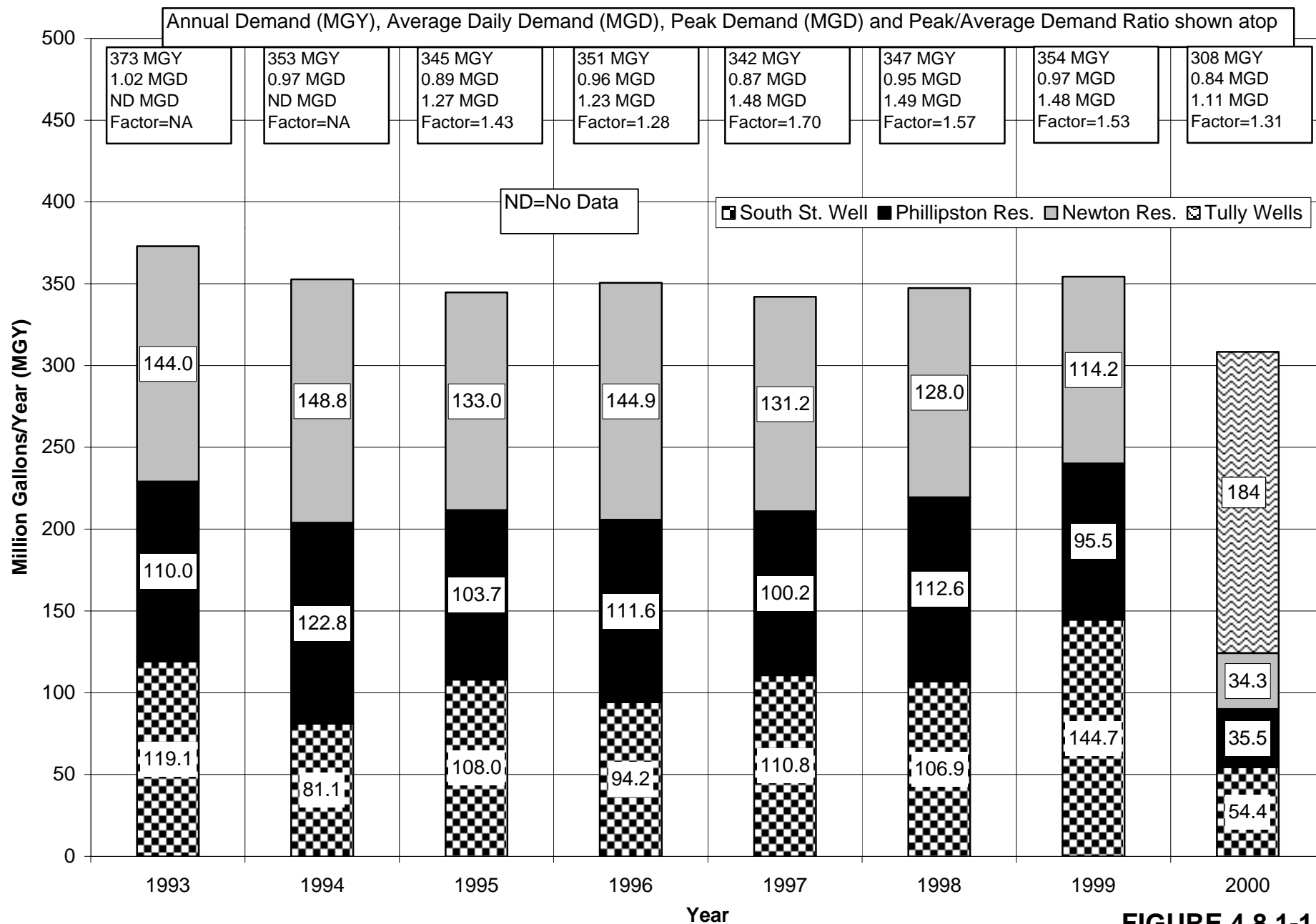
FIGURE 4.7.1-1

**American Tissue Mills: Summary of Monthly Water Sources Used to Meet Demand on a  
Monthly Basis-Averages Based on Period 1994-1995**



**FIGURE 4.7.1-2**

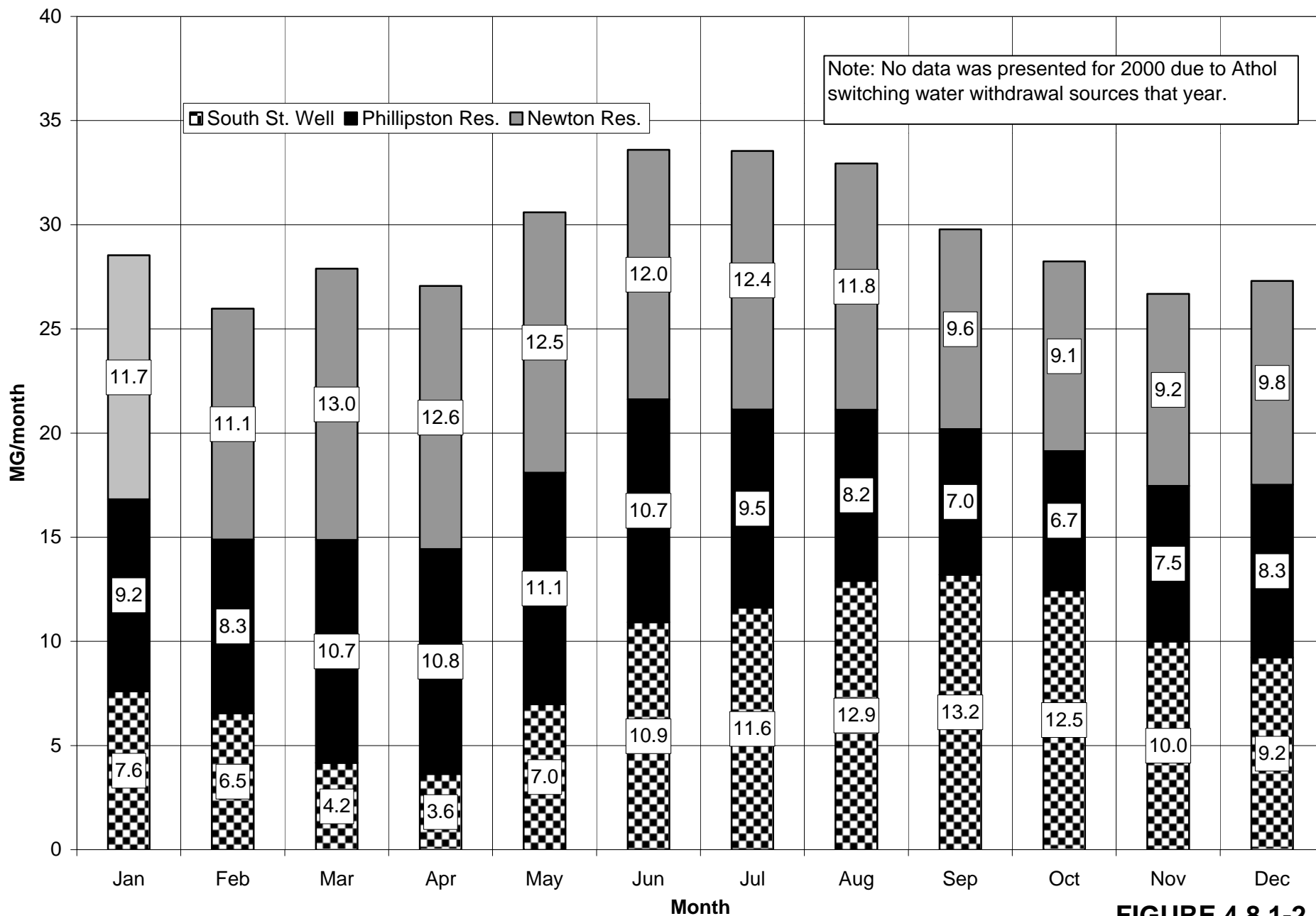
# **Athol Department of Public Works Water Division: Summary of Water Usage and Sources from 1993-2000**



**FIGURE 4.8.1-1**

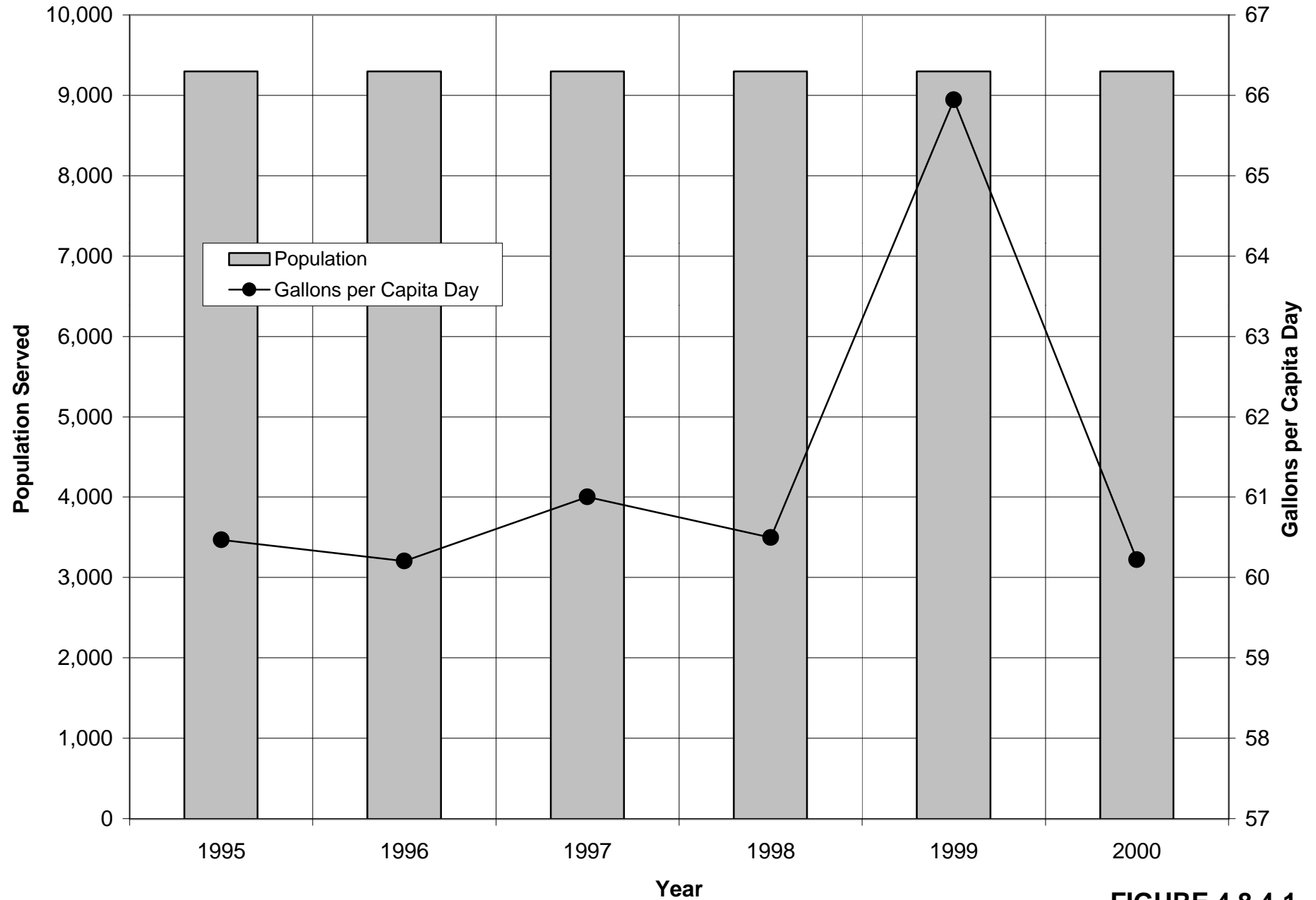


**Athol Department of Public Works Water Division: Summary of Monthly Water Sources Used to Meet Demand on a Monthly Basis-Averages Based on Period 1993-1999**



**FIGURE 4.8.1-2**

**Athol Department of Public Works- Water Division- Population Served Throughout the year and  
Average Gallons Per Capita Day (gpcd)**



**FIGURE 4.8.4-1**

# Orange Water Department: Summary of Water Usage and Sources from 1993-2000

Annual Demand (MGY), Average Daily Demand (MGD), Peak Demand (MGD) and Peak/Average Demand Ratio shown atop

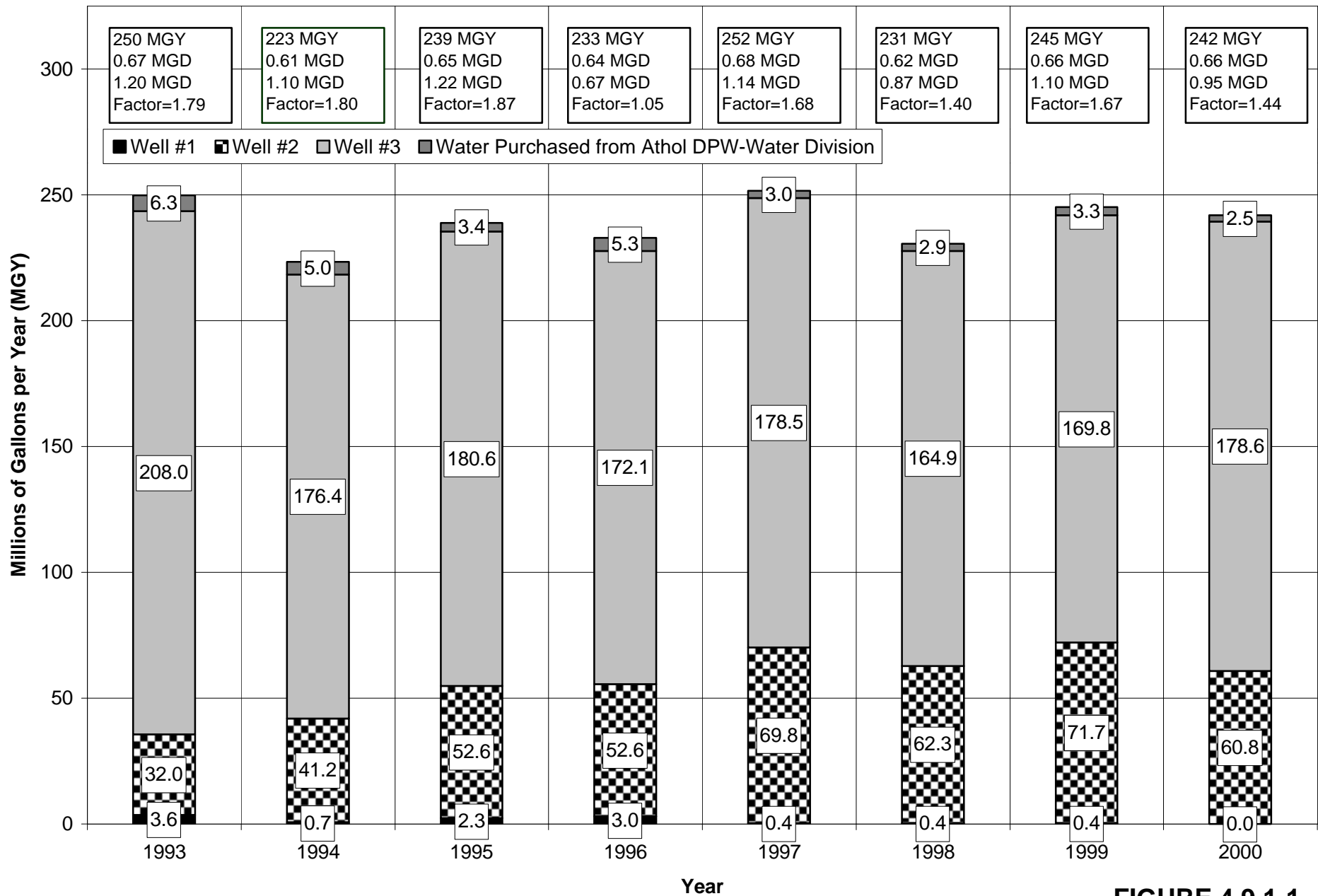
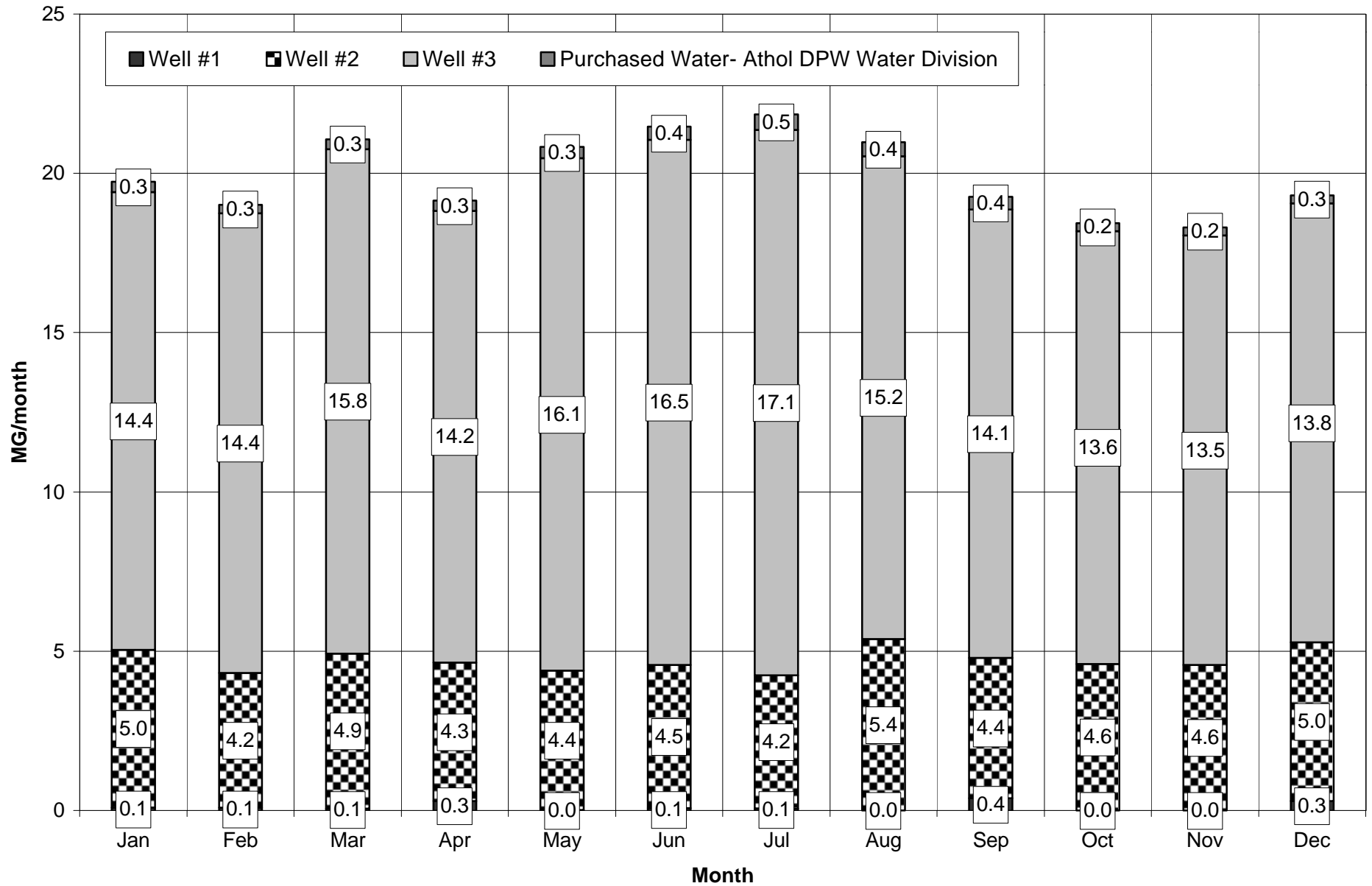


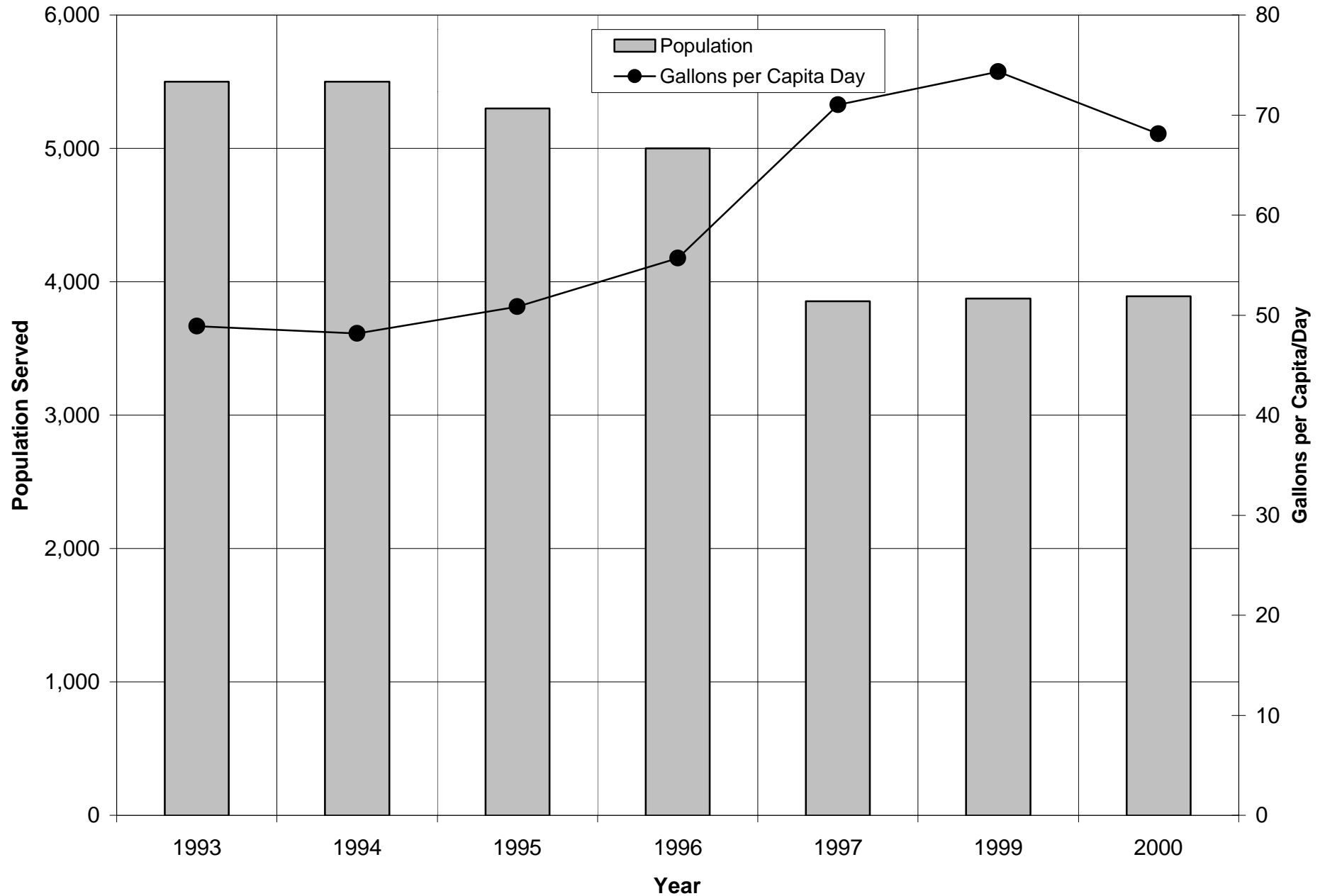
FIGURE 4.9.1-1

**Orange Water Department: Summary of Monthly Water Sources Used to Meet Demand on a  
Monthly Basis-Averages Based on Period 1993-2000**



**FIGURE 4.9.1-2**

**Orange Water Department- Population Served Throughout the Year and  
Average Daily Gallons per Capita Day (gpcd) (1998 missing)**



**FIGURE 4.9.4-1**



## Erving Paper Mills: Summary of Water Usage and Sources from 1993-2000

Annual Demand (MGY), Average Daily Demand (MGD), Peak Demand (MGD) and Peak/Average Demand Ratio shown

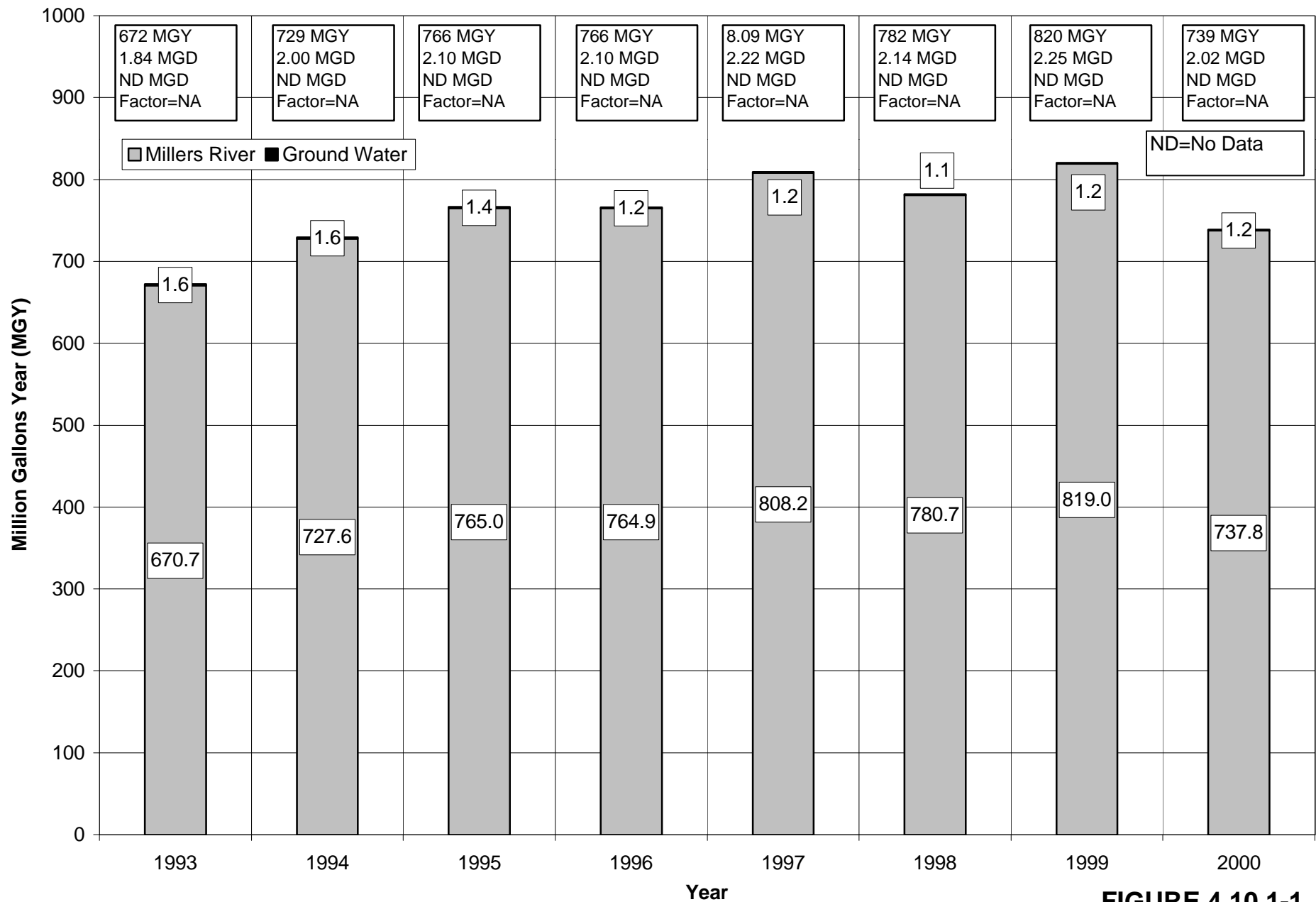
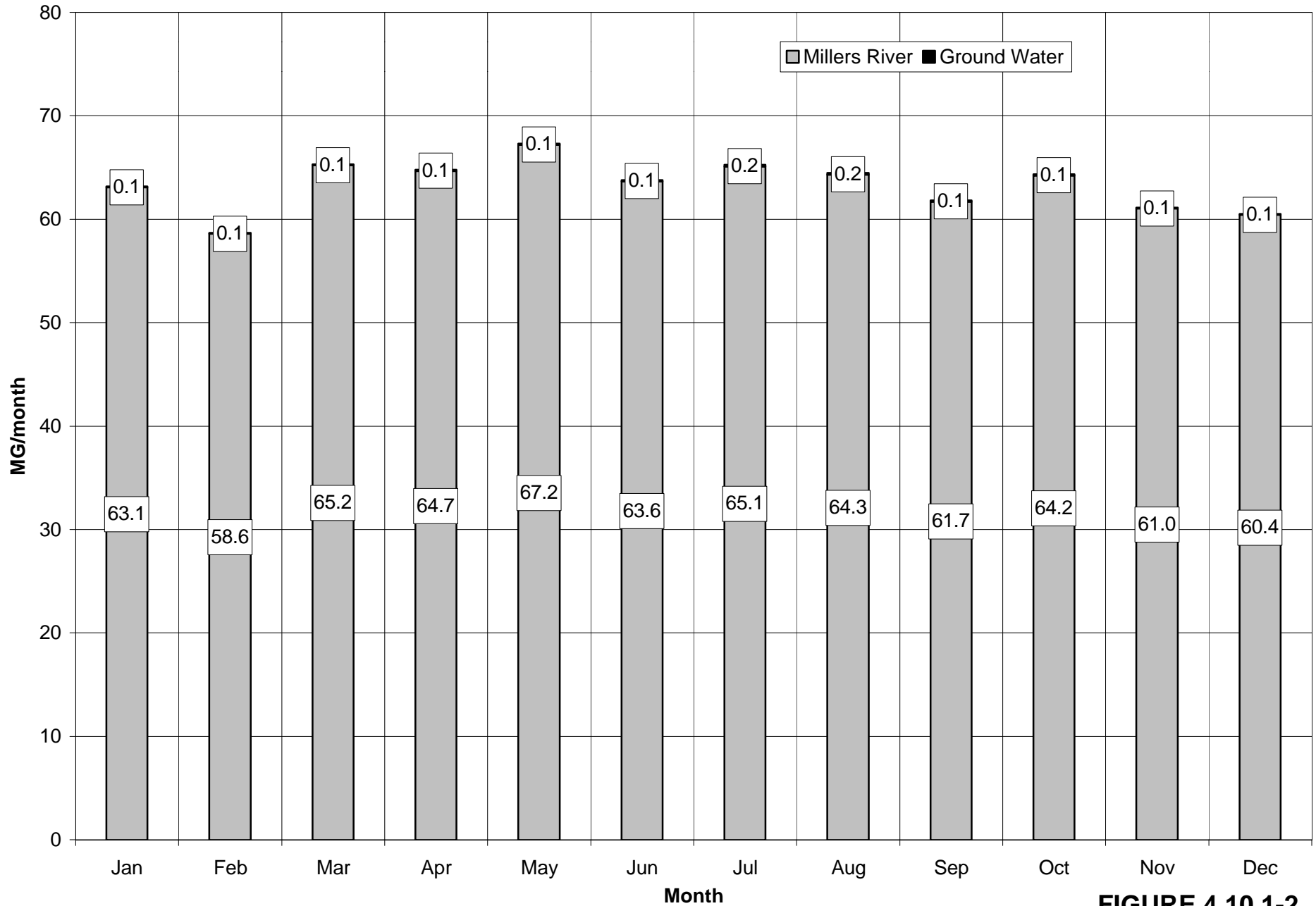


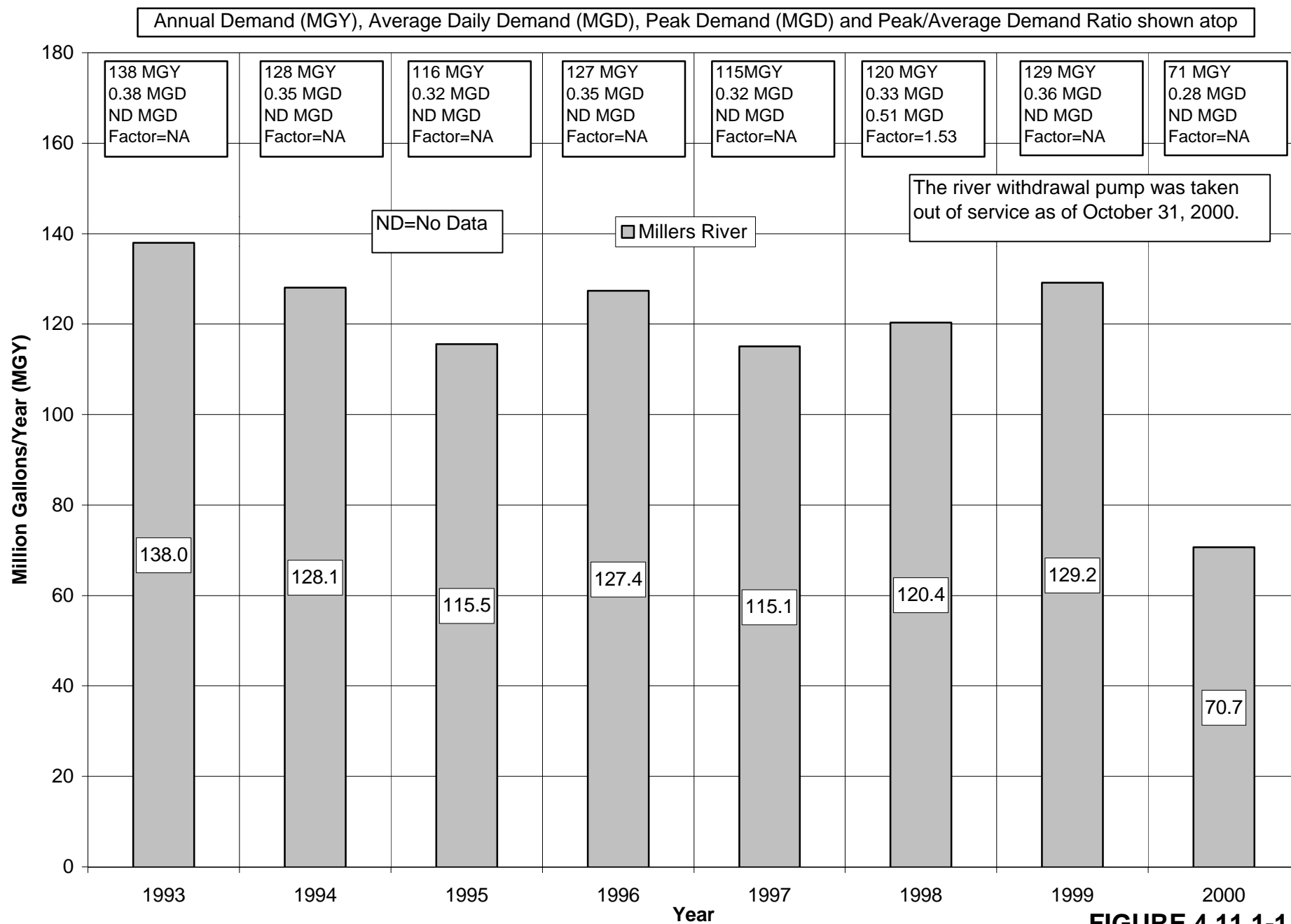
FIGURE 4.10.1-1

**Erving Paper Mills: Summary of Monthly Water Sources Used to Meet Demand on a Monthly Basis-  
Averages Based on Period 1993-2000**



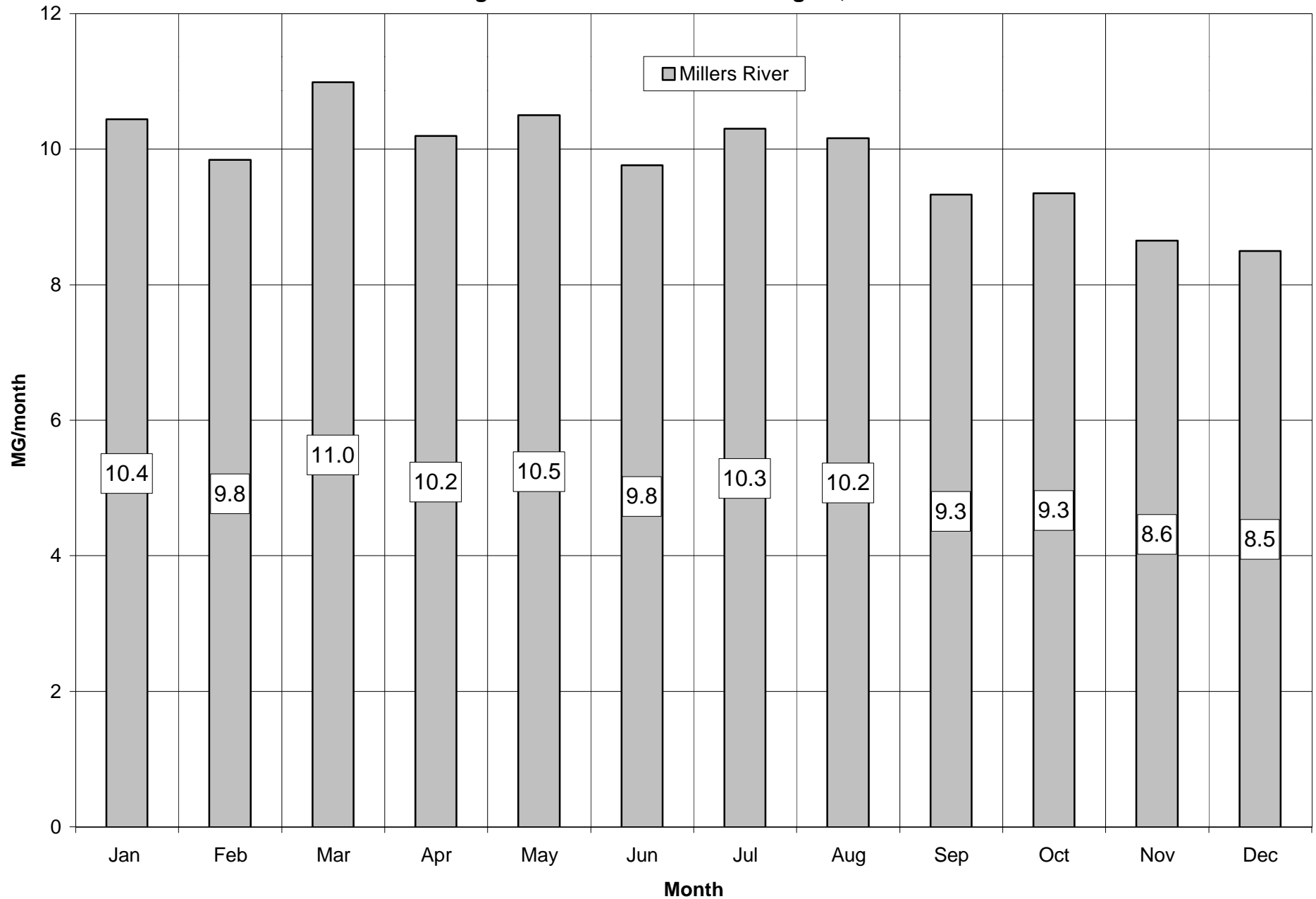
**FIGURE 4.10.1-2**

## International Paper: Summary of Water Usage and Sources from 1993-2000



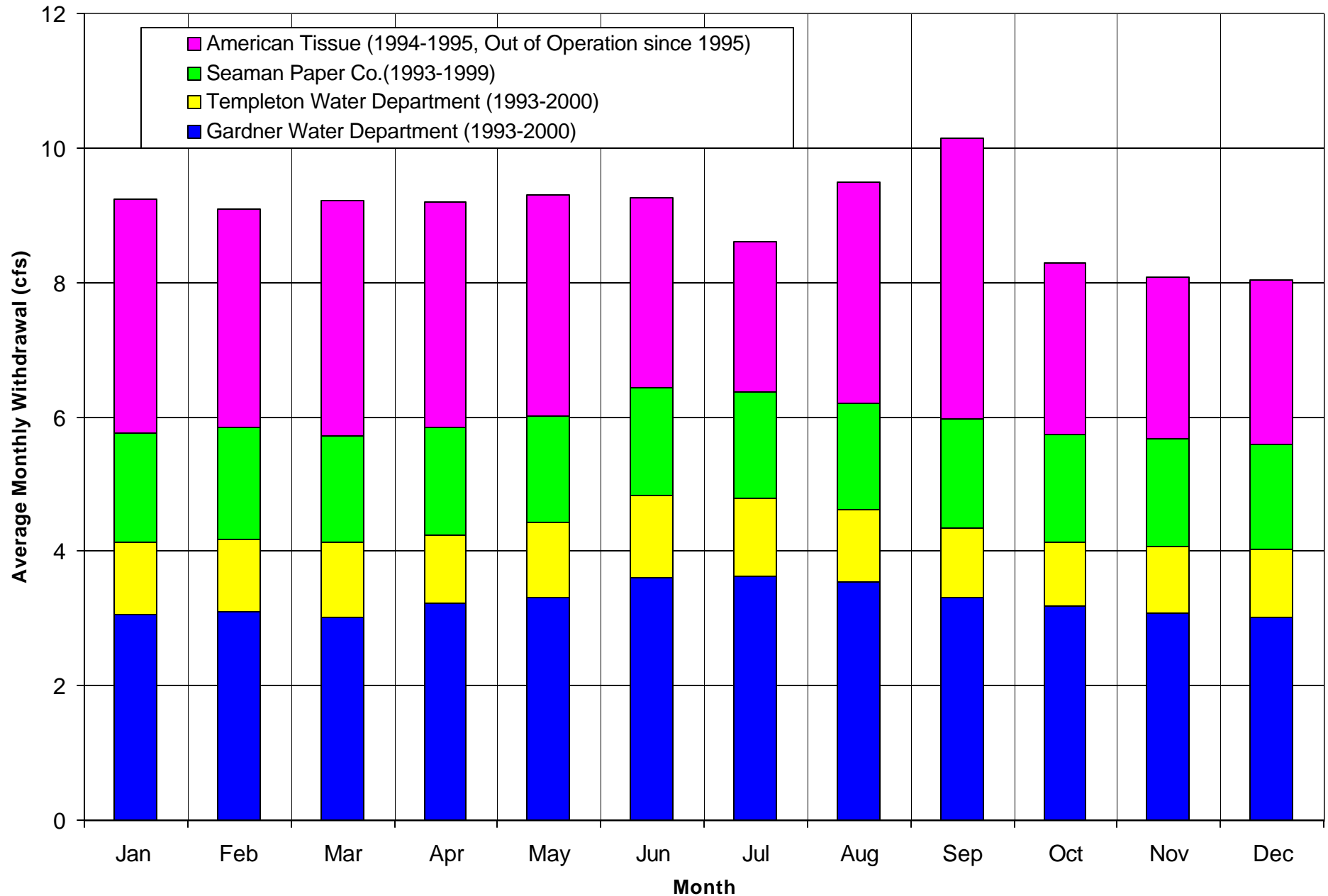
**FIGURE 4.11.1-1**

**International Paper: Summary of Monthly Water Sources Used to Meet Demand on a Monthly Basis  
Averages Based on Period 1993-August, 2000**



**FIGURE 4.11.1-2**

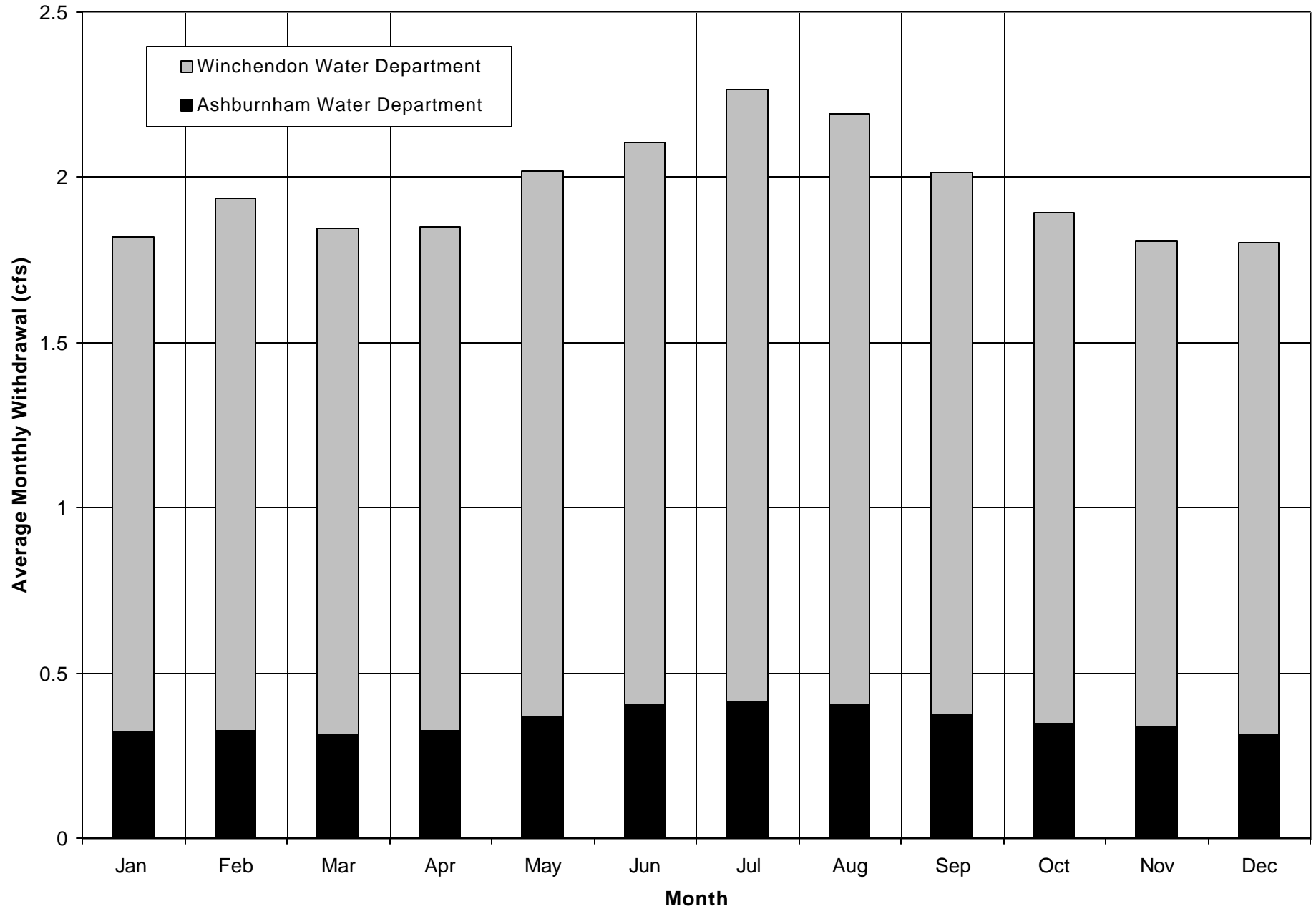
**Average Monthly Water Withdrawals from the Otter River Basin,  
Drainage Area=60.54 square miles, Period of Record Varies as shown in legend**



**FIGURE 4.13-1**

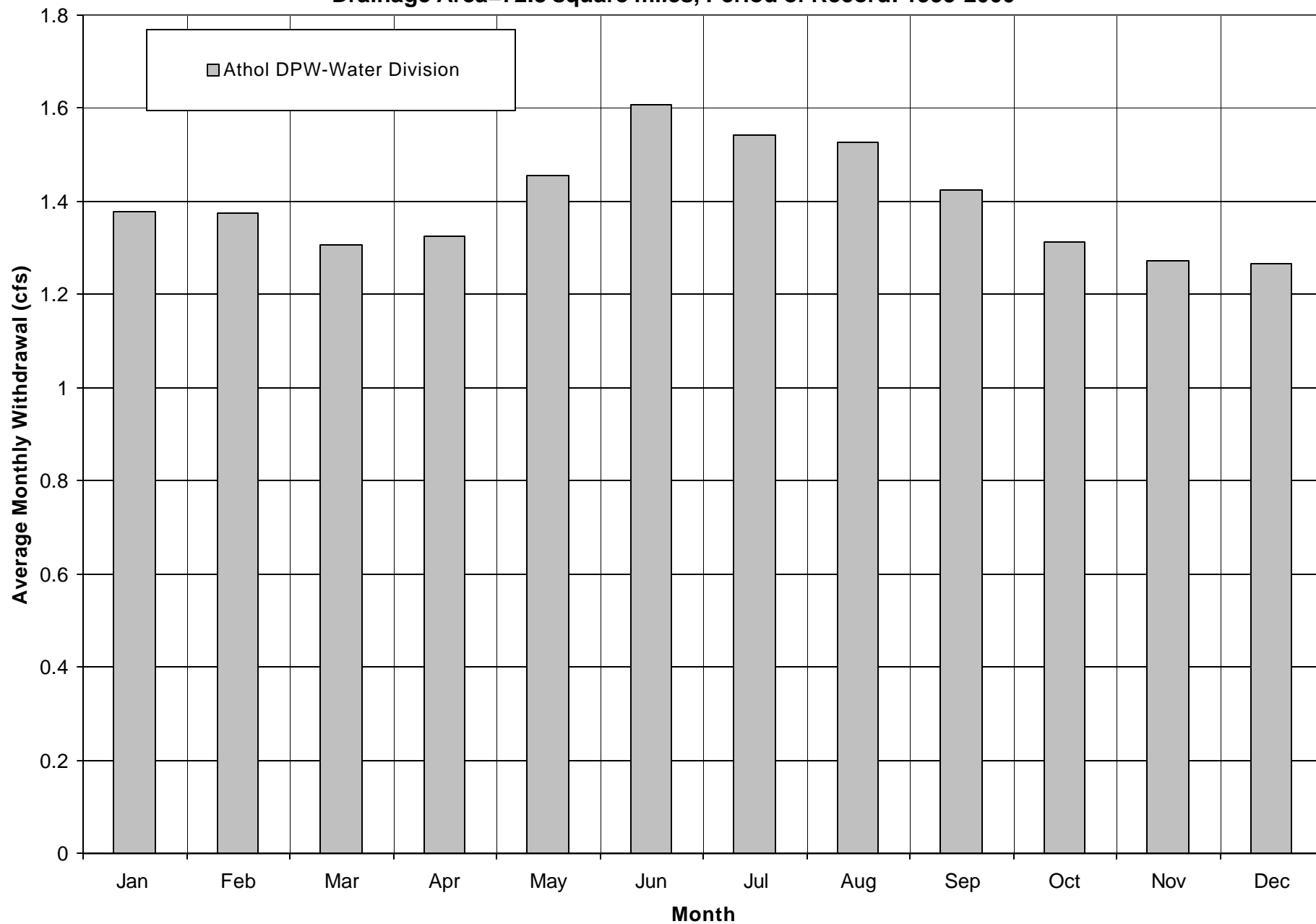


**Average Monthly Water Withdrawals from Upper Naukeag Lake,  
Drainage Area= 1.98 square miles, Period of Record: 1993-2000**



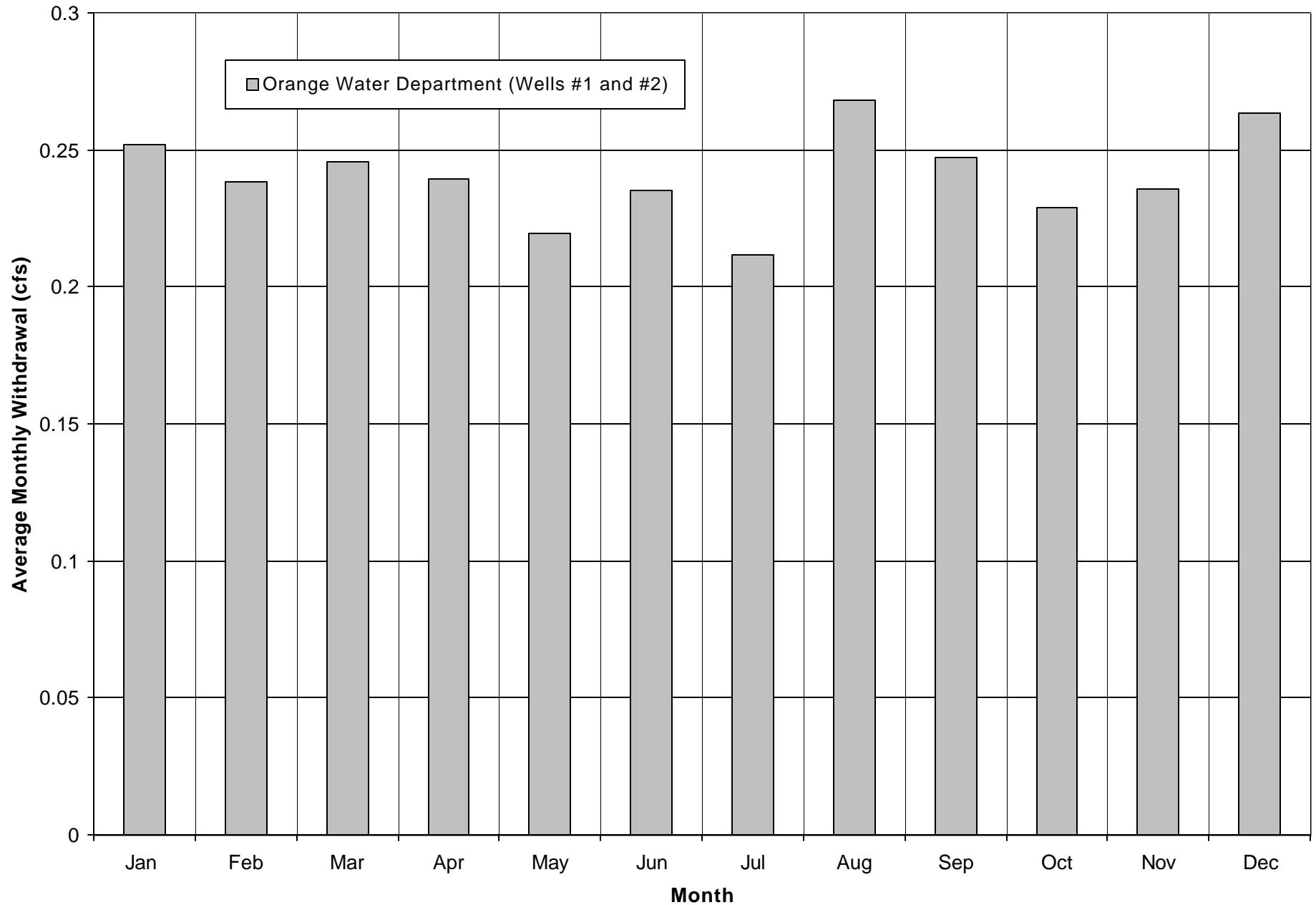
**FIGURE 4.13-2**

**Average Monthly Water Withdrawals from Tully River Basin**  
**Drainage Area=72.8 square miles, Period of Record: 1995-2000**



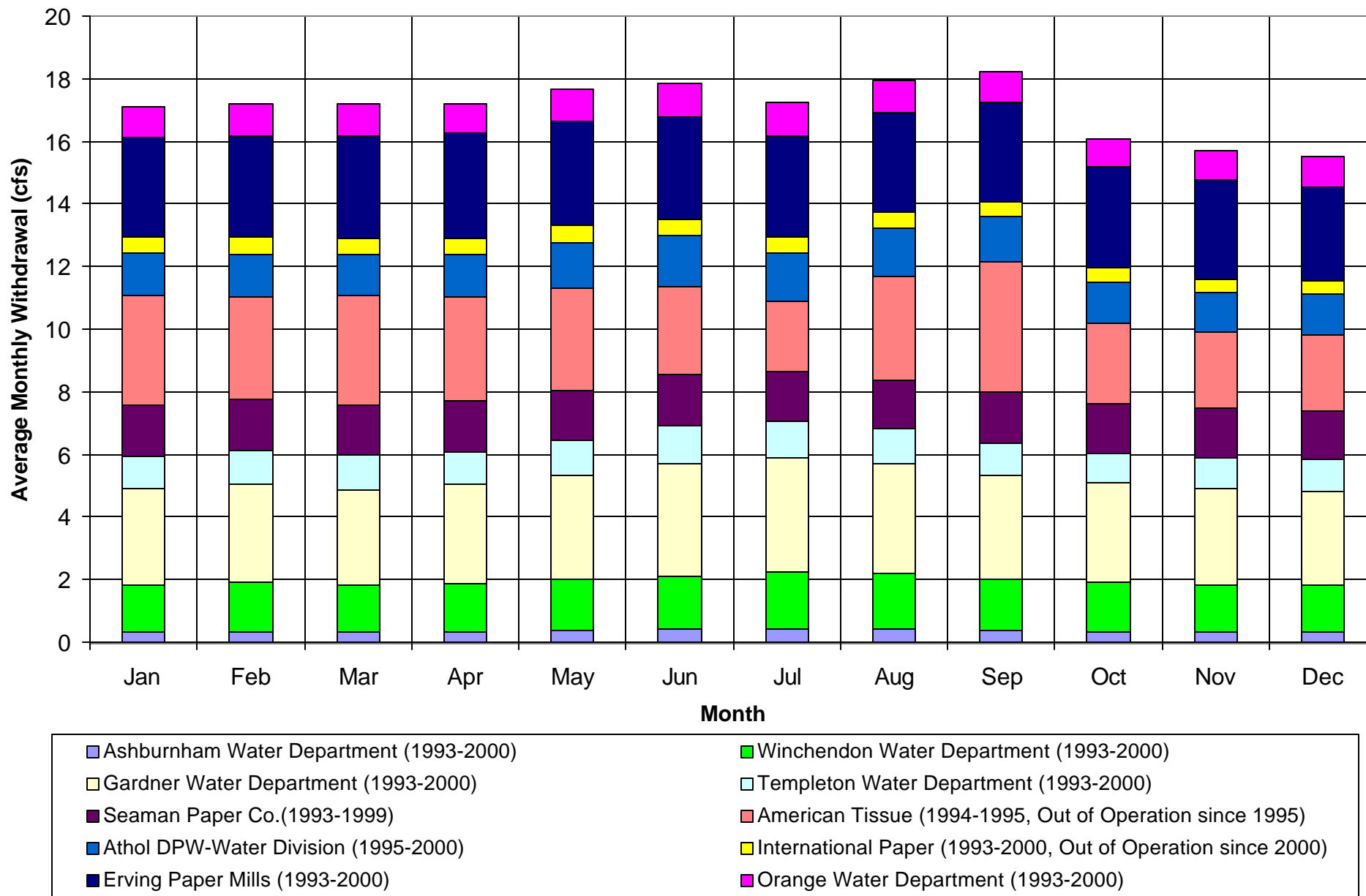
**FIGURE 4.13-3**

**Average Monthly Water Withdrawals from North Pond Brook Basin,  
Drainage Area=1.98 square miles, Period of Record: 1993-2000**



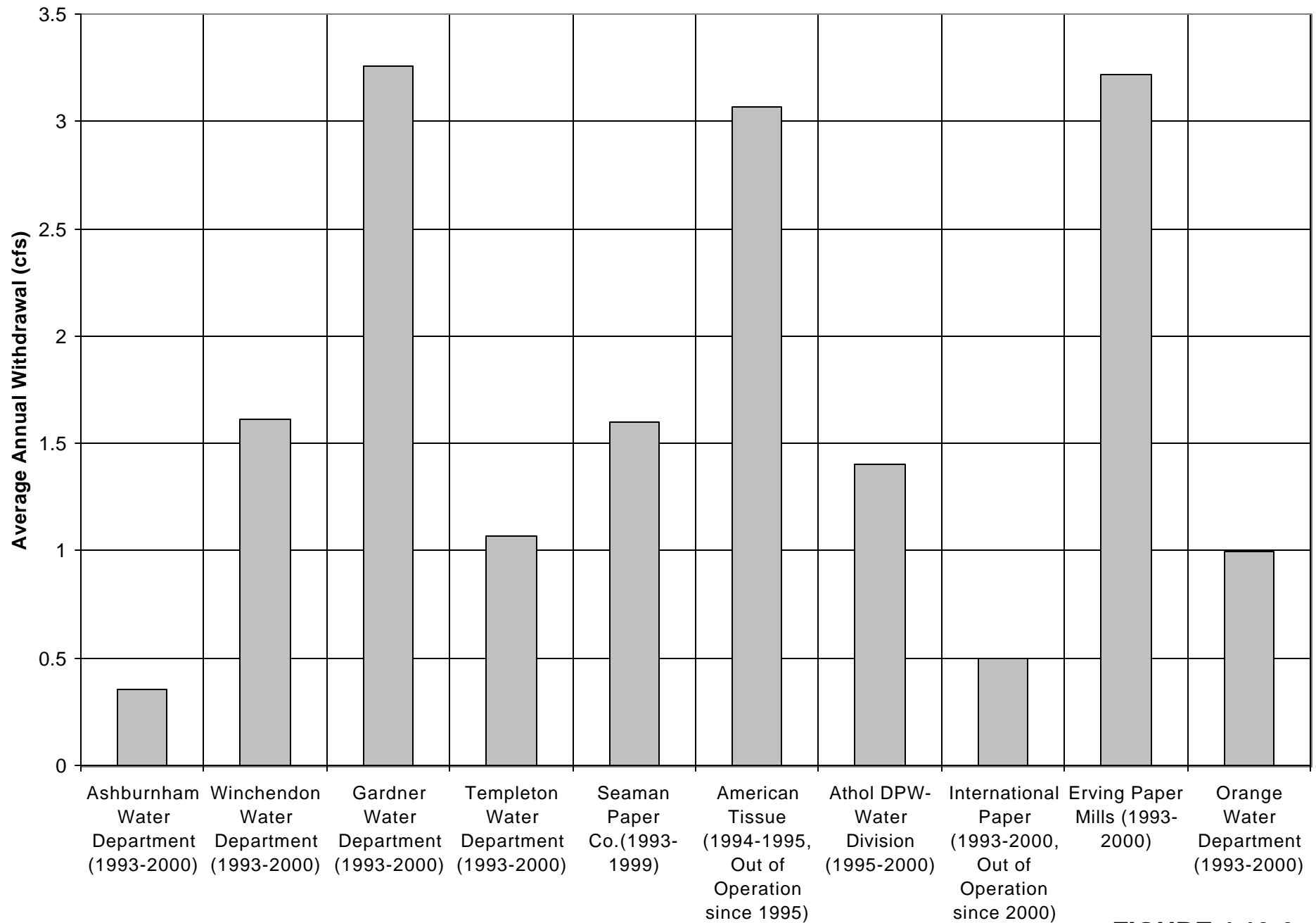
**FIGURE 4.13-4**

**Average Monthly Water Withdrawals from the Millers River Basin,  
Drainage Area= 388.87 square miles, Period of Record varies as shown in the legend**



**FIGURE 4.13-5**

**Average Annual Water Withdrawals within the Millers River Basin**

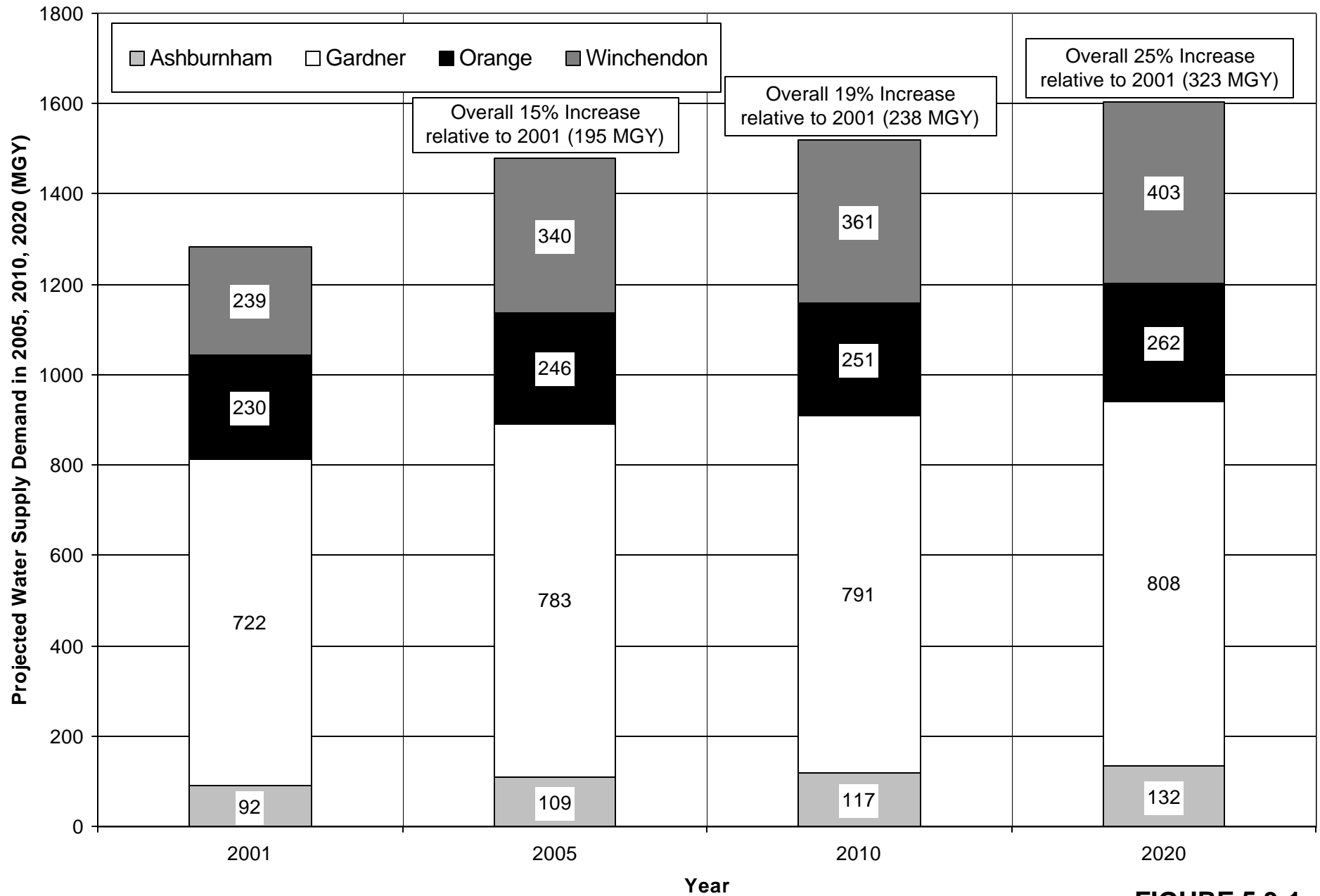


**FIGURE 4.13-6**

## **SECTION 5.0: FIGURES AND TABLES**



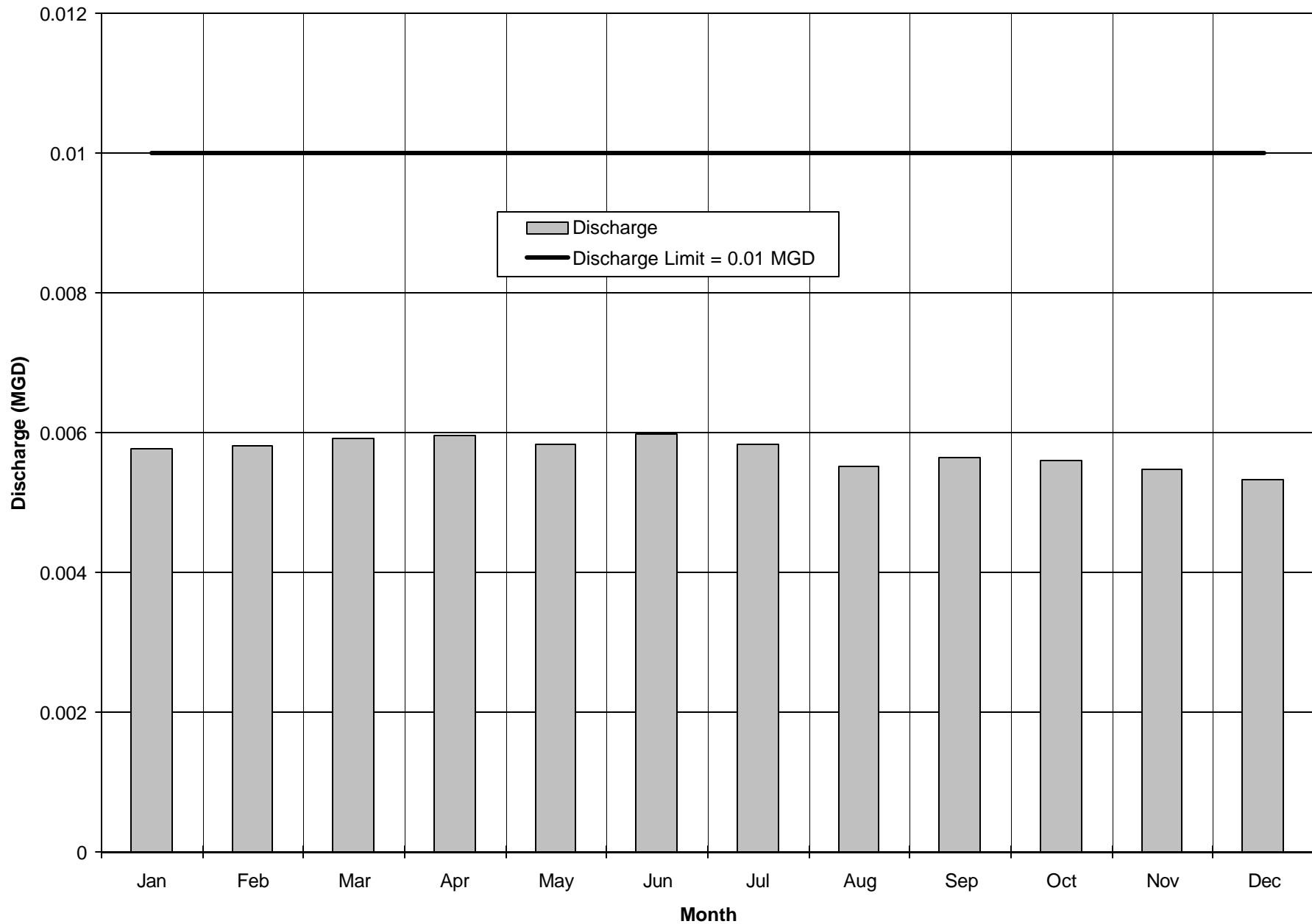
**Forecasted Water Supply Demands in 2005, 2010 and 2020 relative to 2001 for the following Water Departments: Ashburnham, Gardner, Orange and Winchendon**



**FIGURE 5.3-1**

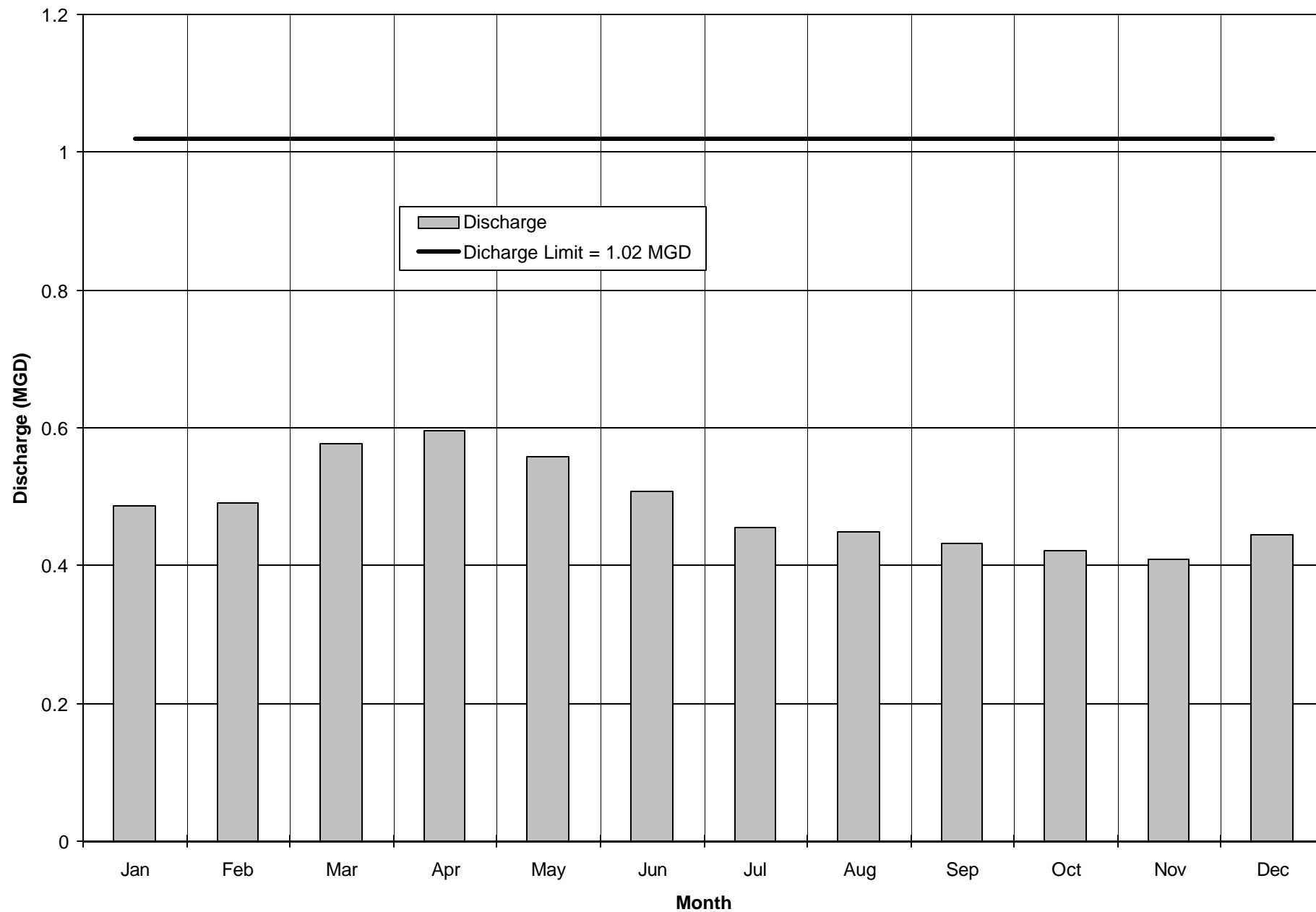
## **SECTION 6.0: FIGURES AND TABLES**

**Erving POTW #3: Average Monthly Discharge for Period of Record:  
February 1996 - October 2001**



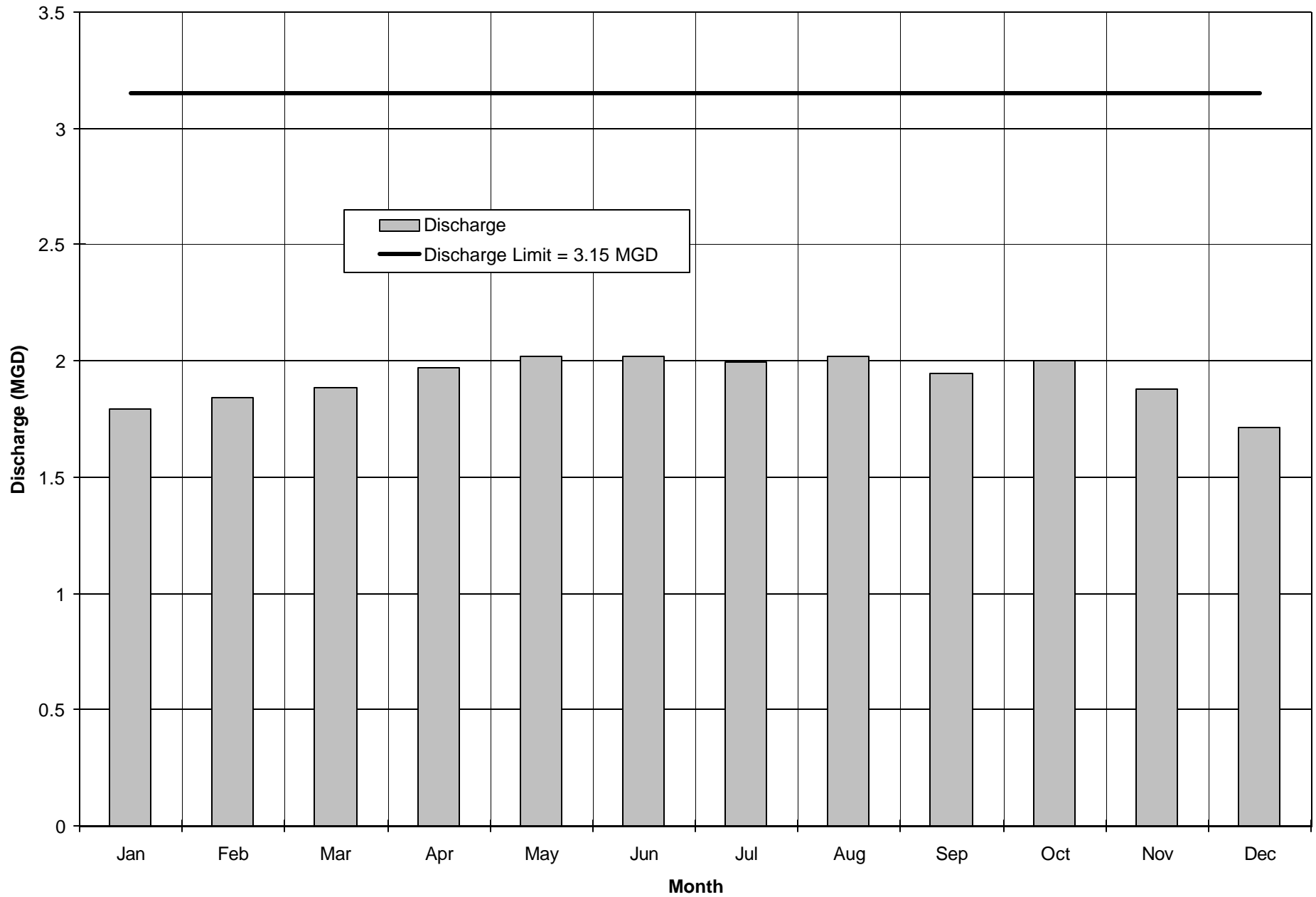
**FIGURE 6.2-1**

**Erving POTW #1: Average Monthly Discharge for Period of Record:  
January 1993 - November 2001**



**FIGURE 6.2-2**

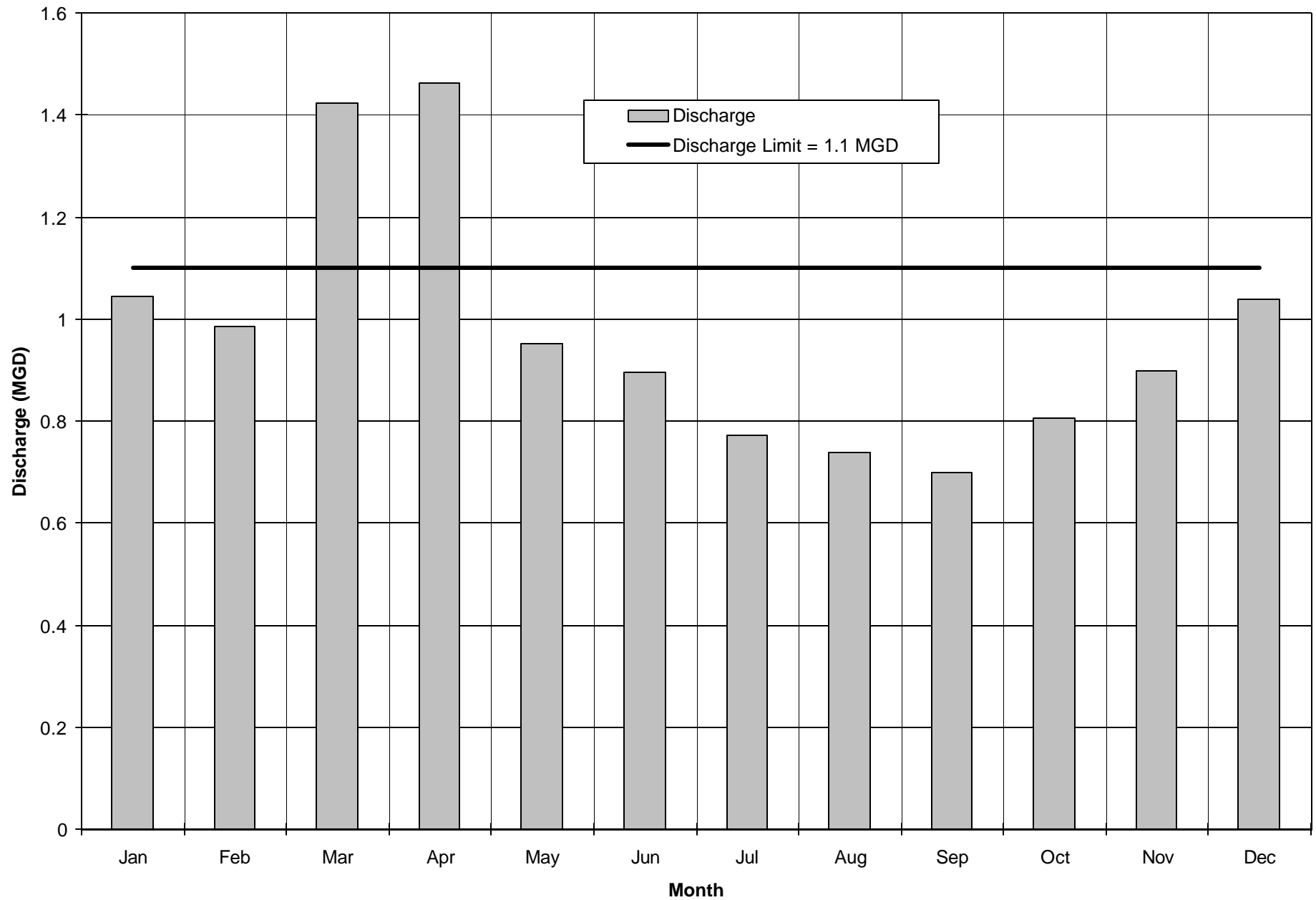
**Erving Center WWTP: Average Monthly Discharge for Period of Record:  
January 1993 - November 2001**



**FIGURE 6.2-3**

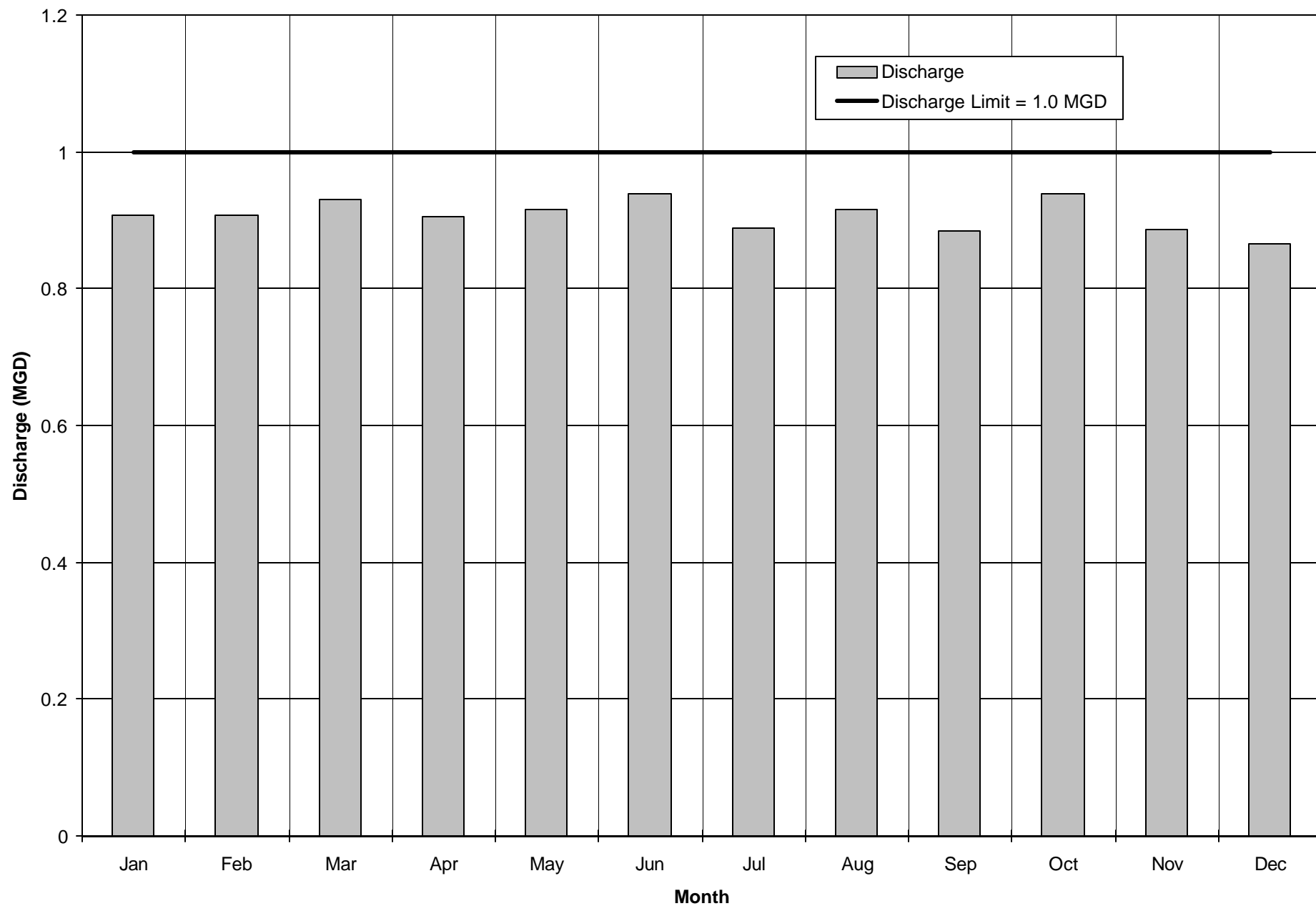


**Orange WWTP: Average Monthly Discharge for Period of Record:  
January 1993 - November 2001**



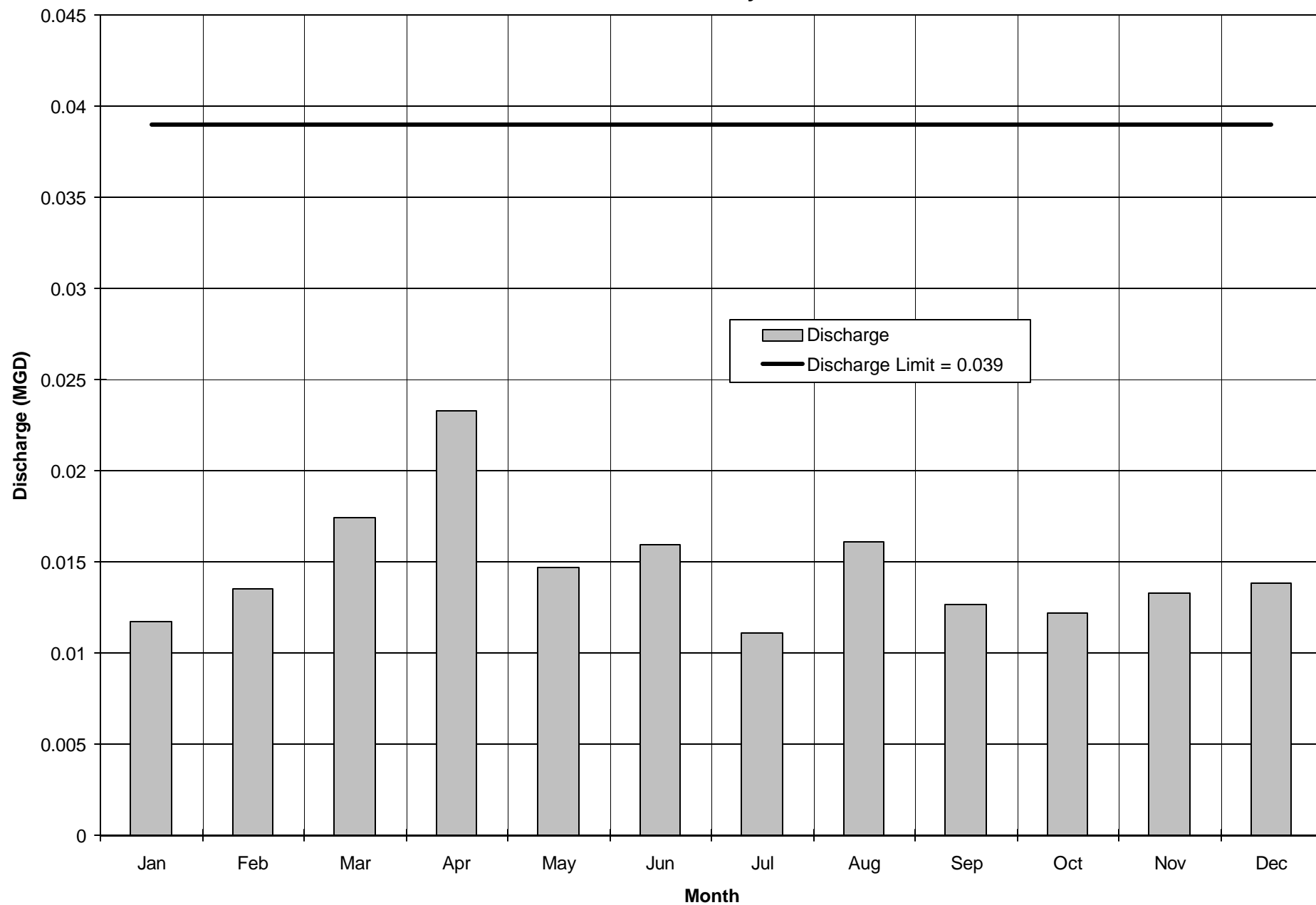
**FIGURE 6.2-4**

**Seaman Paper Co. of Mass.: Average Monthly Discharge for Period of Record:  
January 1993 - November 2001**



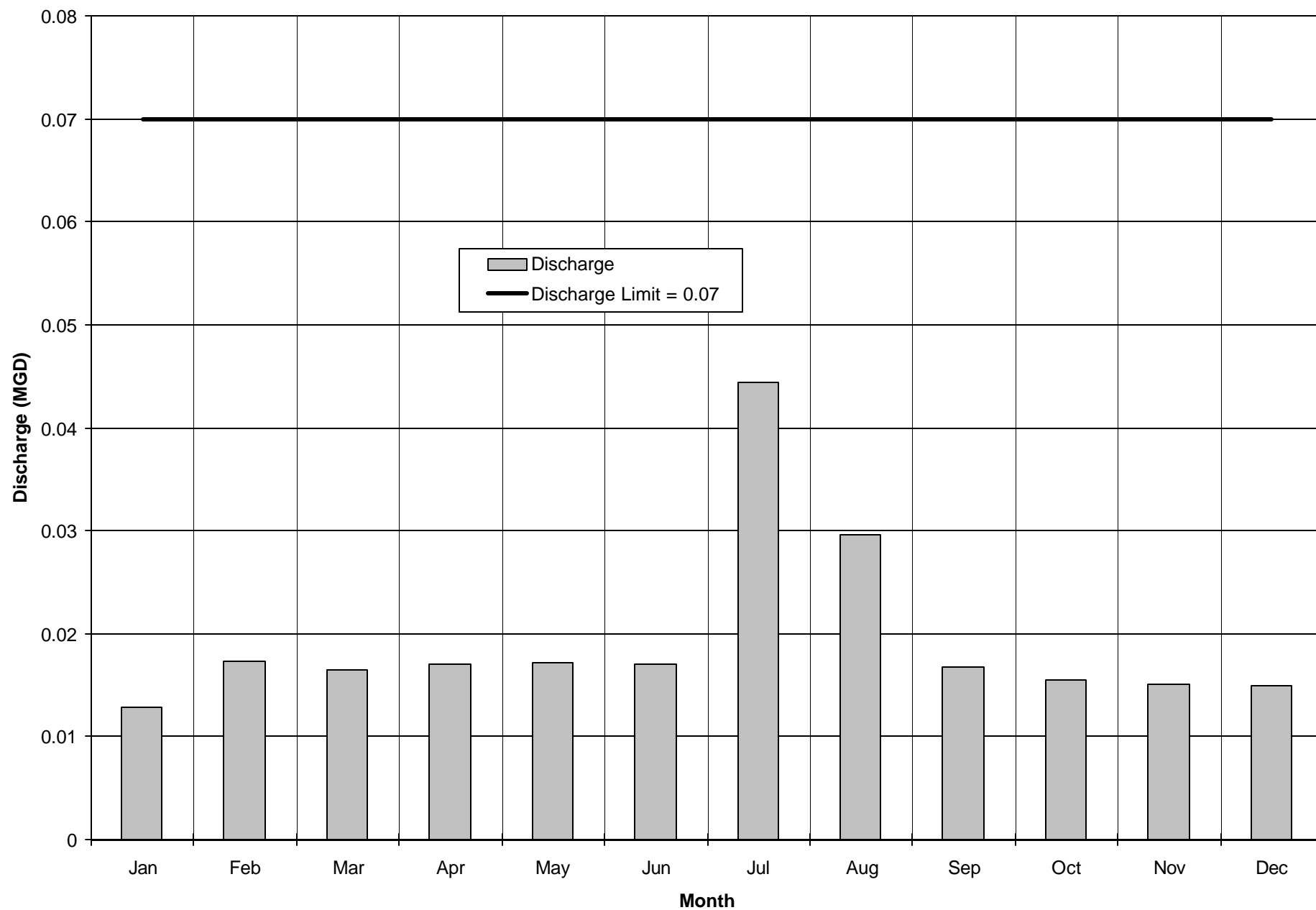
**FIGURE 6.2-5**

**Royalston WWTP: Average Monthly Discharge for Period of Record:  
November 1999 - July 2001**



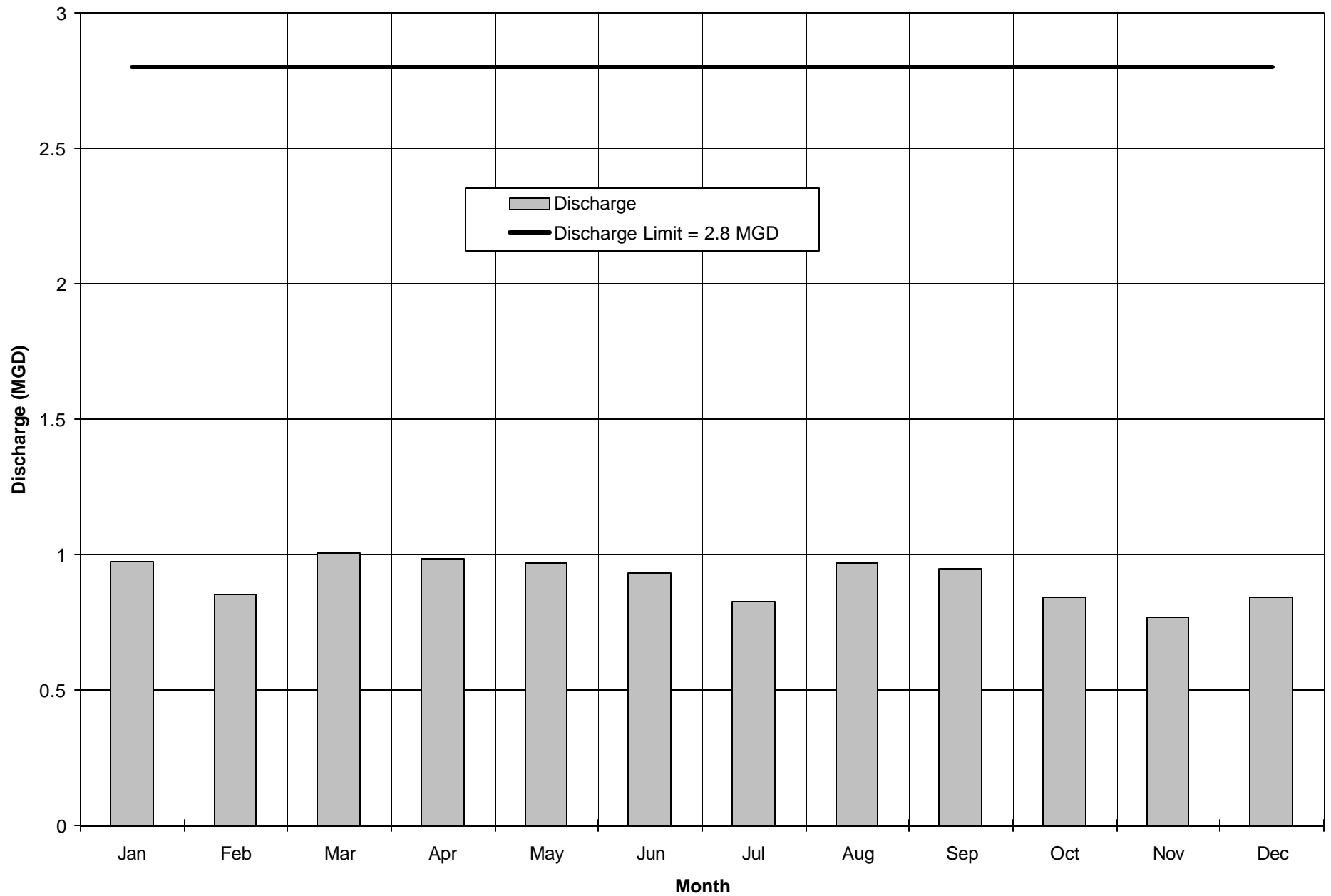
**FIGURE 6.2-6**

**L.S. Starrett: Average Monthly Discharge for Period of Record:  
January 1993 - November 2001**



**FIGURE 6.2-7**

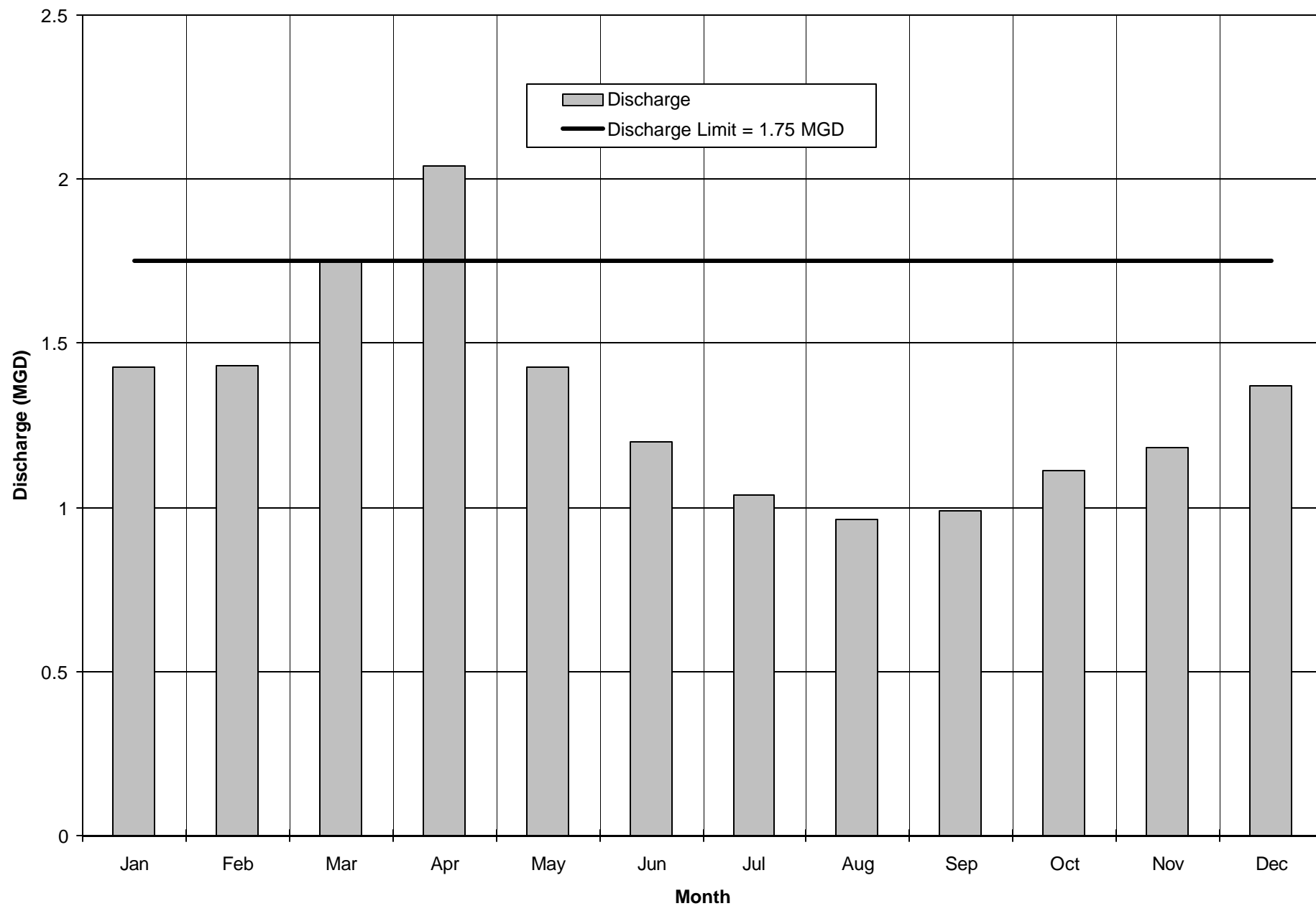
**Templeton WWTP: Average Monthly Discharge for Period of Record :  
January 1993 - November 2001**



**FIGURE 6.2-8**

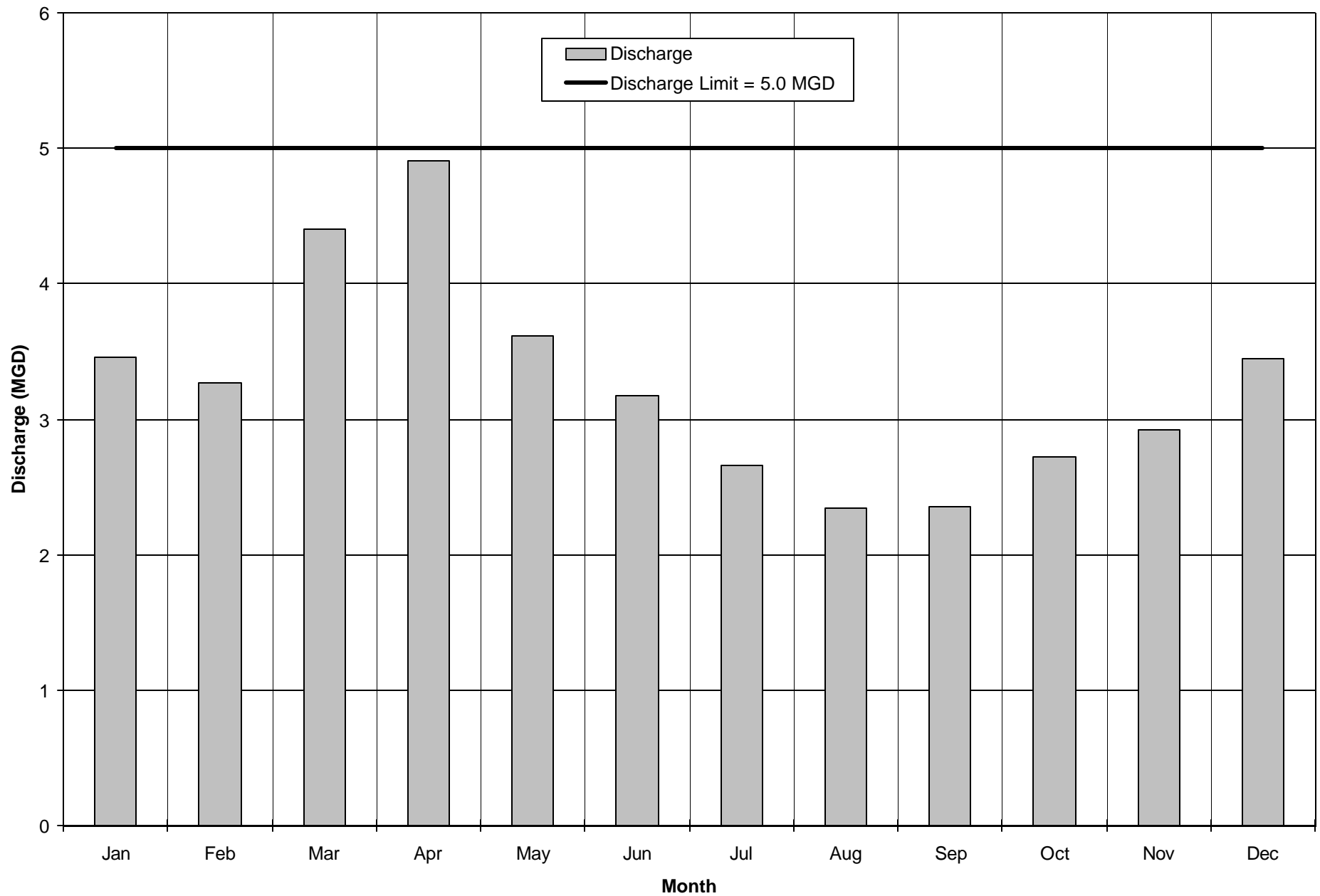


**Athol WWTP: Average Monthly Discharge for Period of Record:  
January 1993 - November 2001**



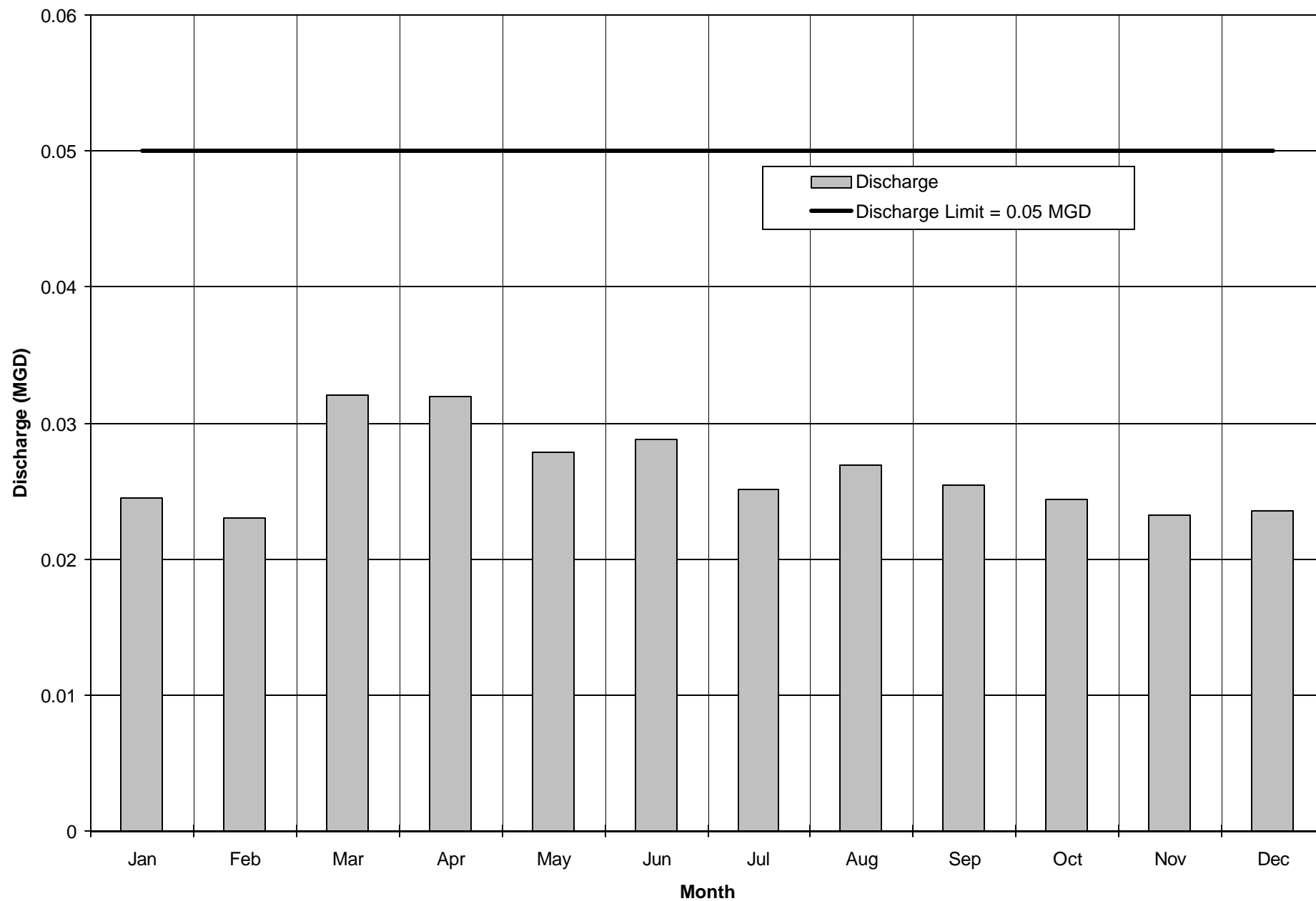
**FIGURE 6.2-9**

**Gardner WWTF: Average Monthly Discharge for Period of Record:  
January 1993 - November 2001**



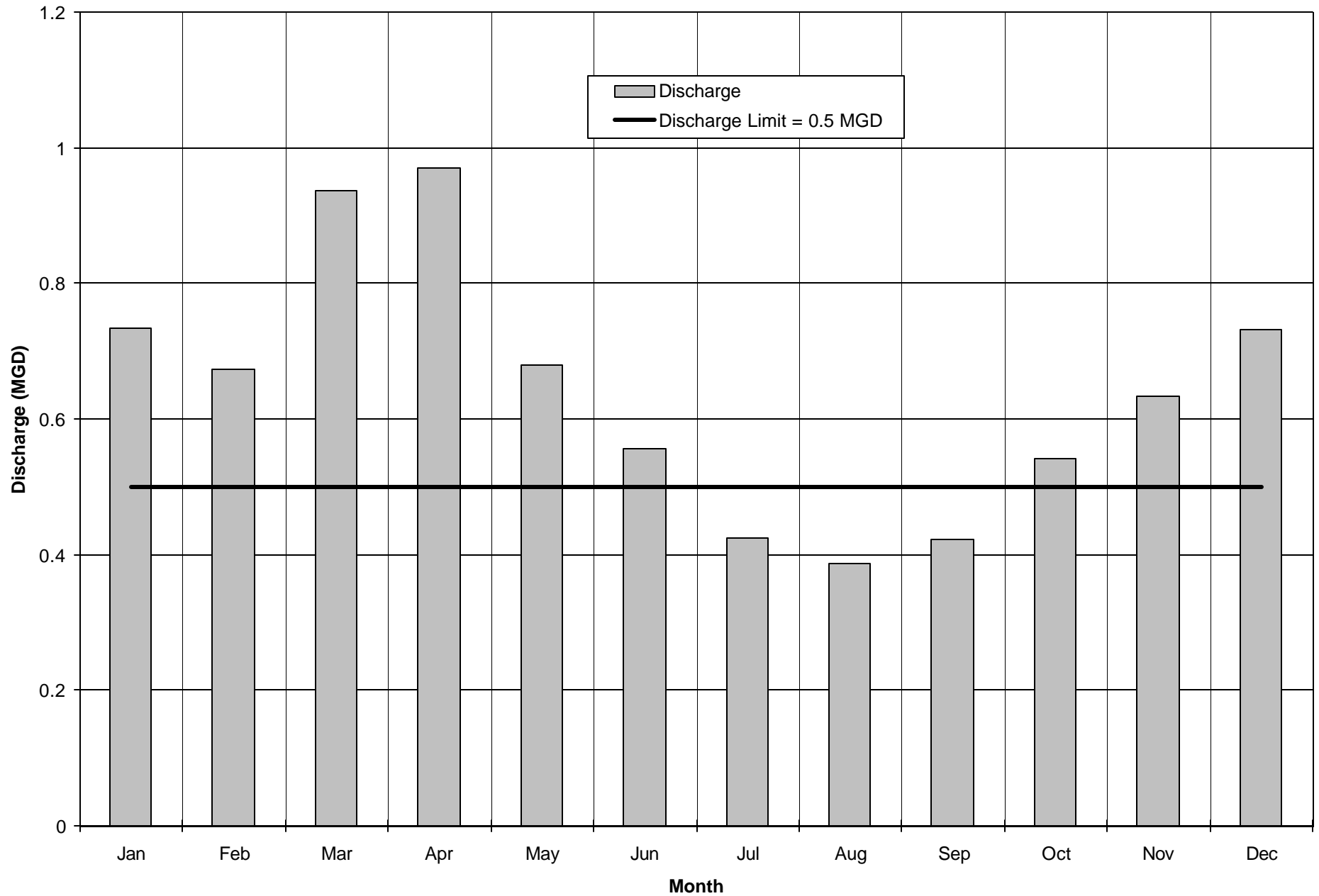
**FIGURE 6.2-10**

**Templeton Development Center: Average Monthly Discharge for Period of Record:  
January 2000 - July 2001**



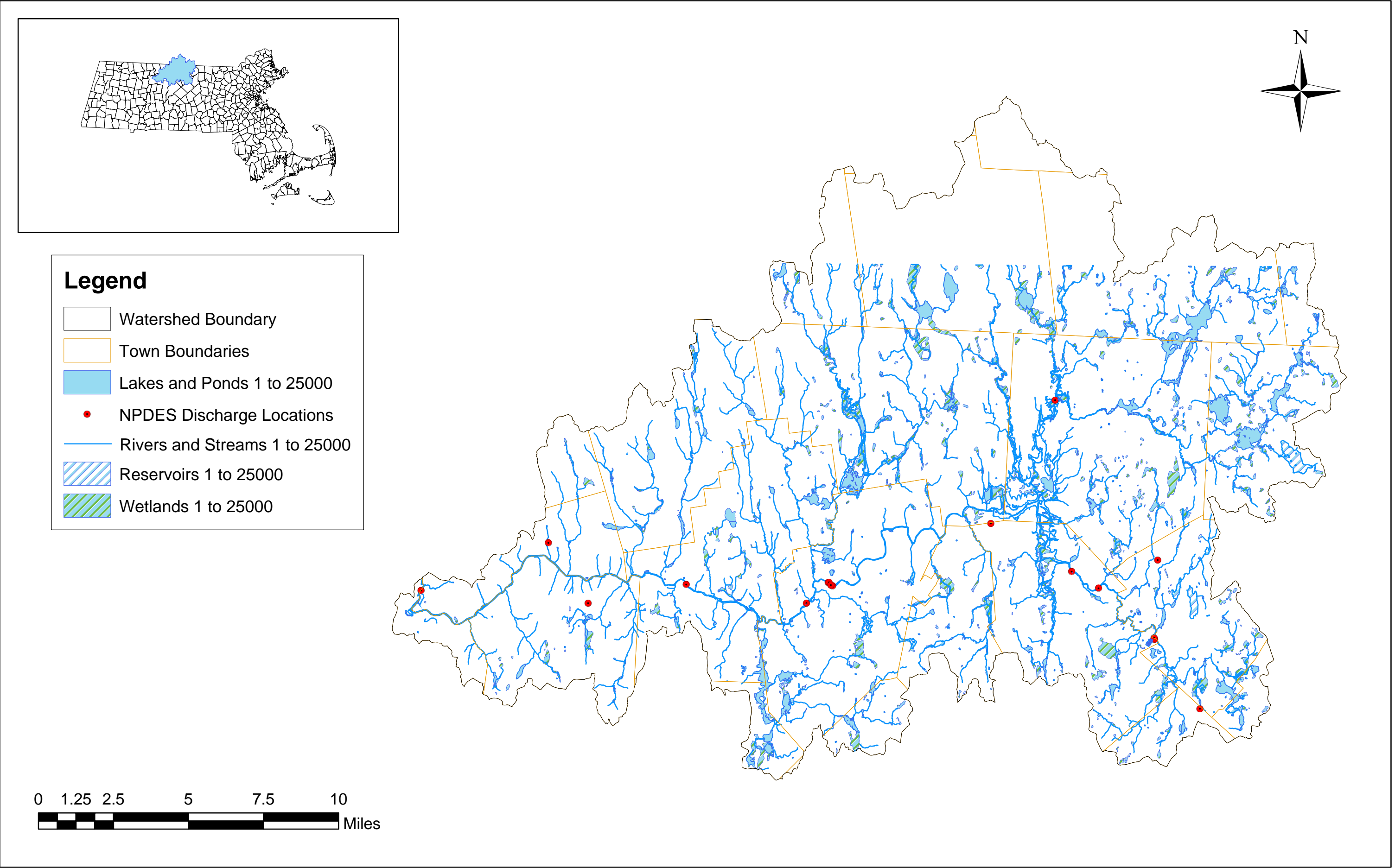
**FIGURE 6.2-11**

**Winchendon WPCF: Average Monthly Discharge for Period of Record:  
January 1993 - November 2001**



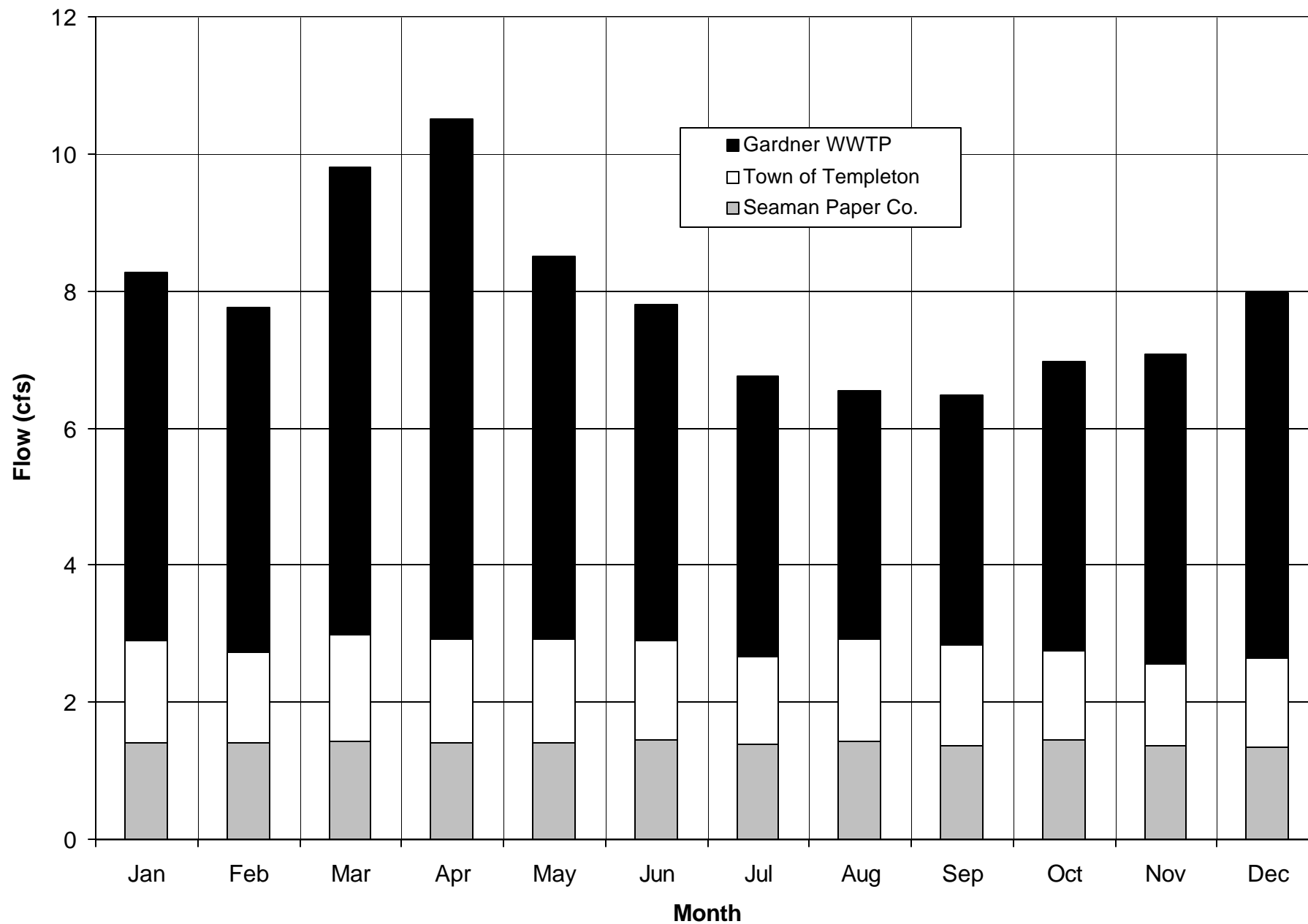
**FIGURE 6.2-12**

Figure 6.2-13: NPDES Discharge Locations in the Millers River Basin



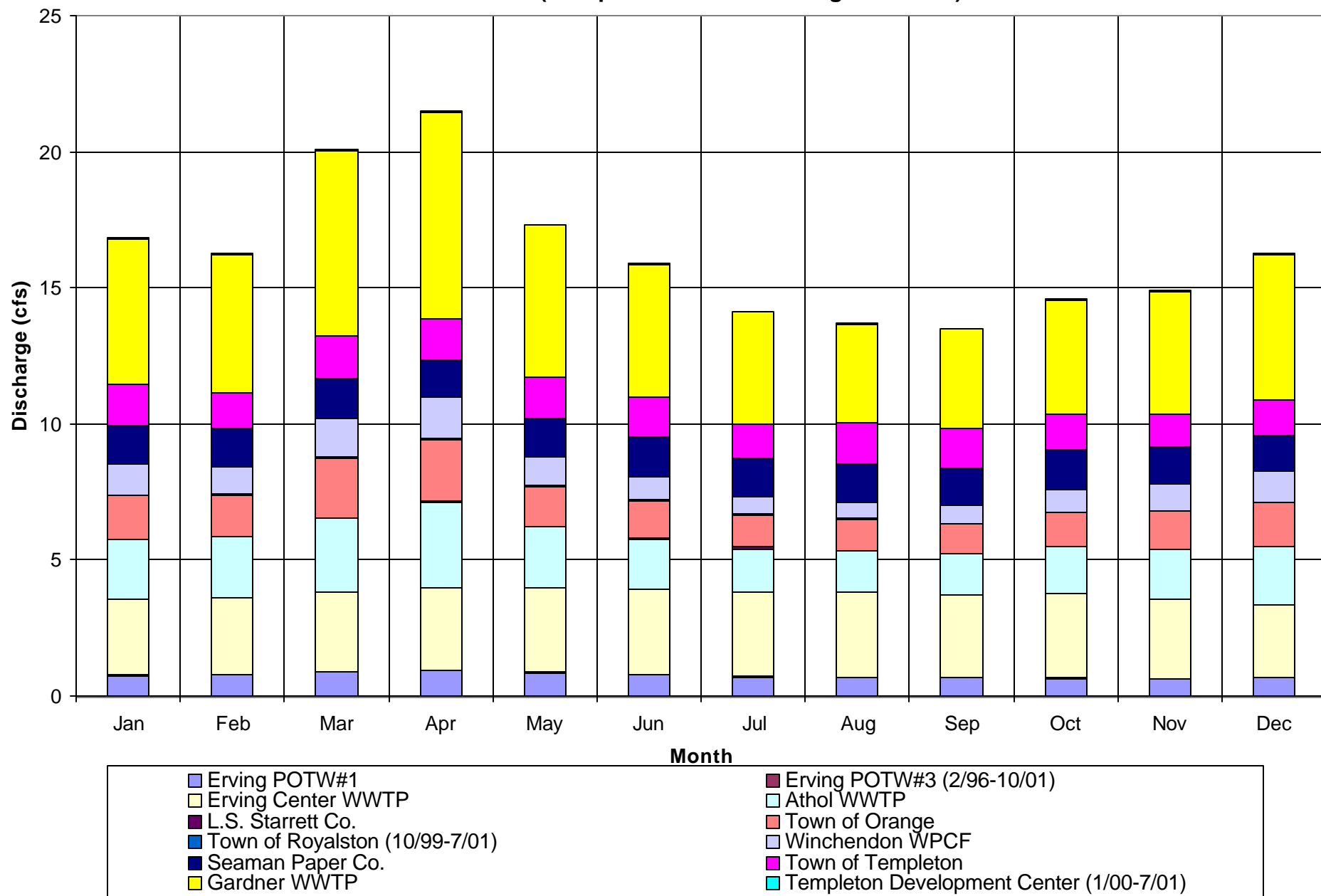


**Otter River Basin- Average Monthly NPDES Discharges for the Period of Record January 1993-  
November 2001**



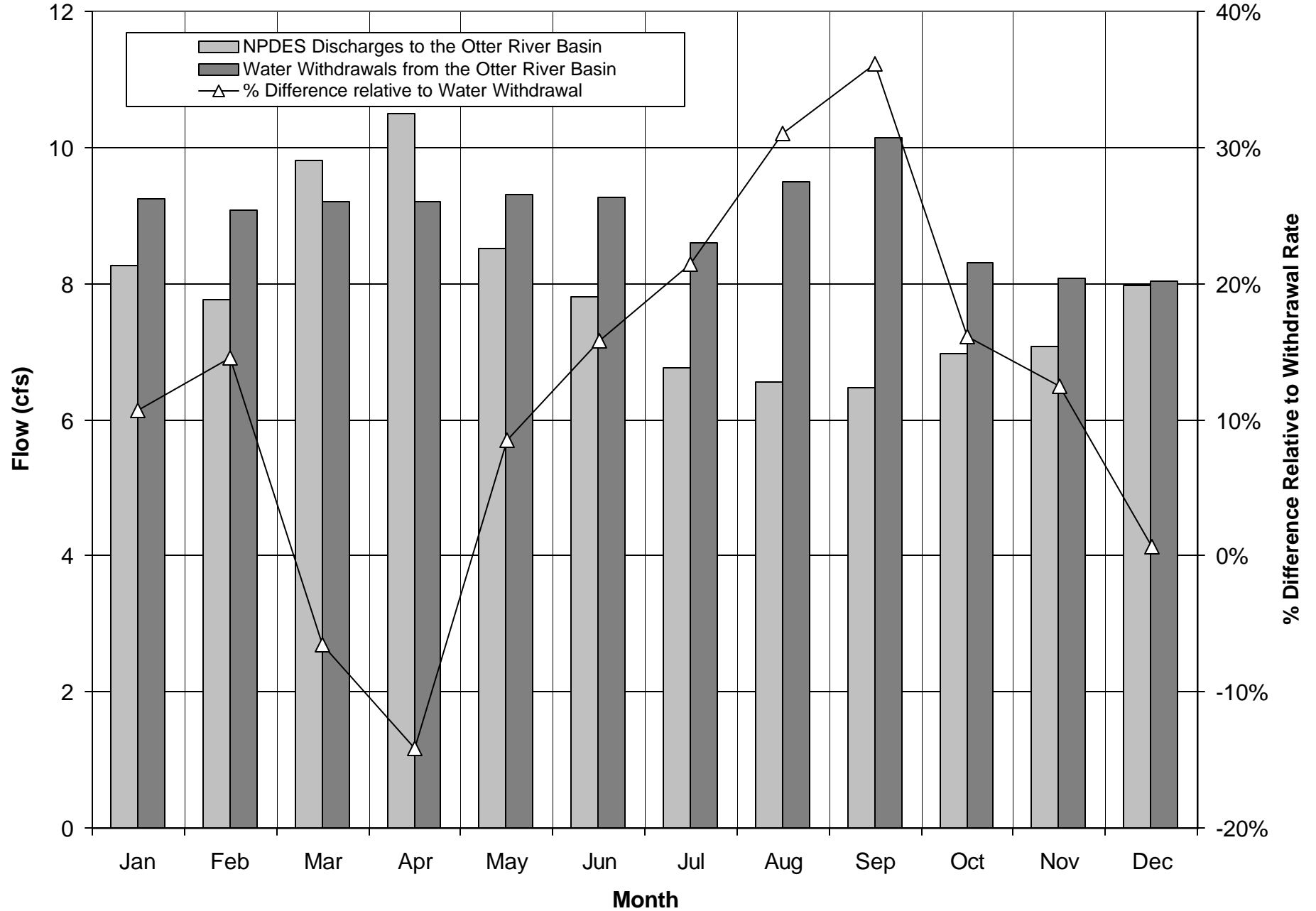
**FIGURE 6.3-1**

**Millers River- Average Monthly NPDES Discharges for the Period of Record January 1993-  
November 2001 (except as shown in the Legend below)**



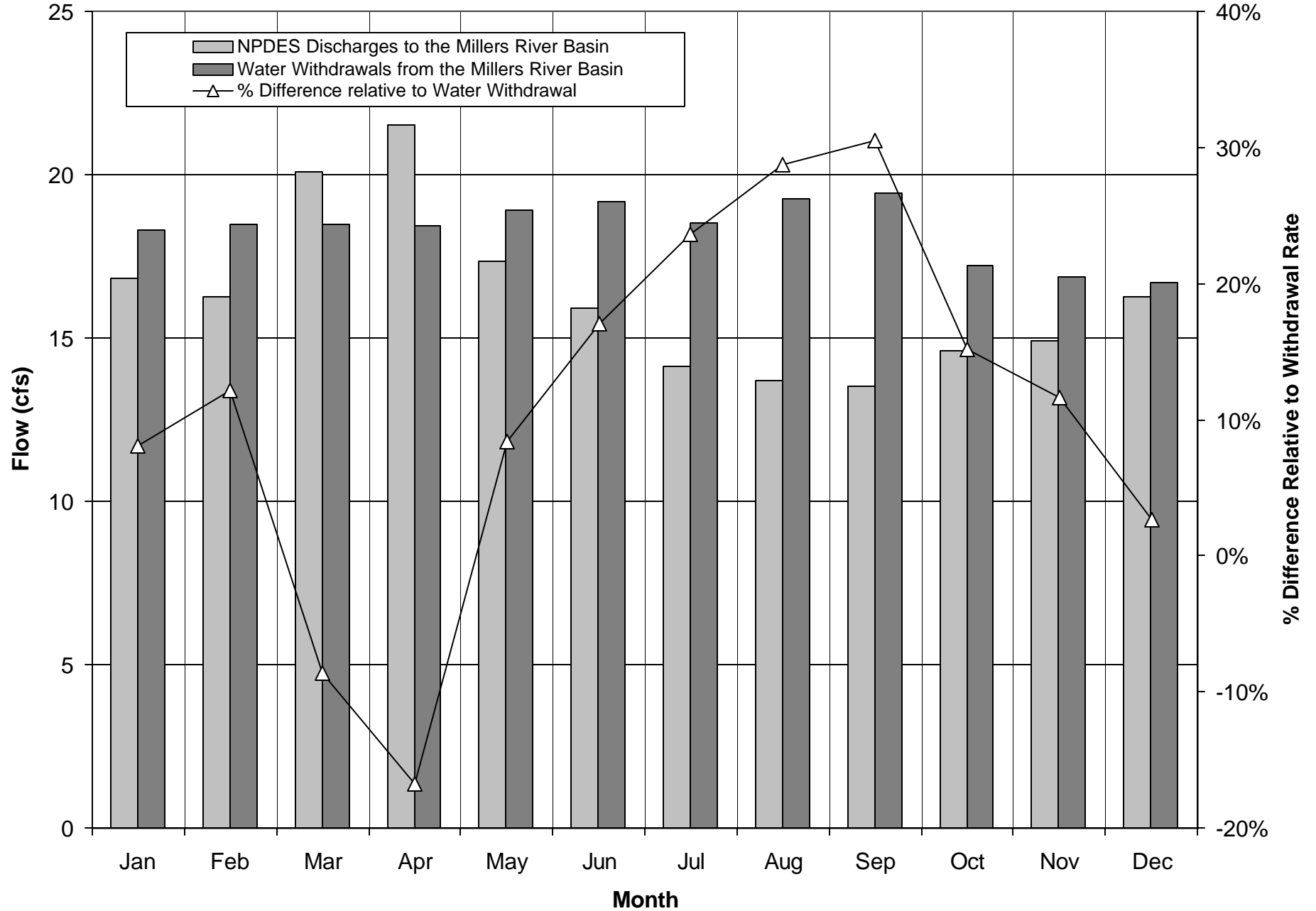
**FIGURE 6.3-2**

**Otter River Basin-Average Monthly Withdrawals and NPDES Discharges (Period of Record Varies)**



**FIGURE 6.3-3**

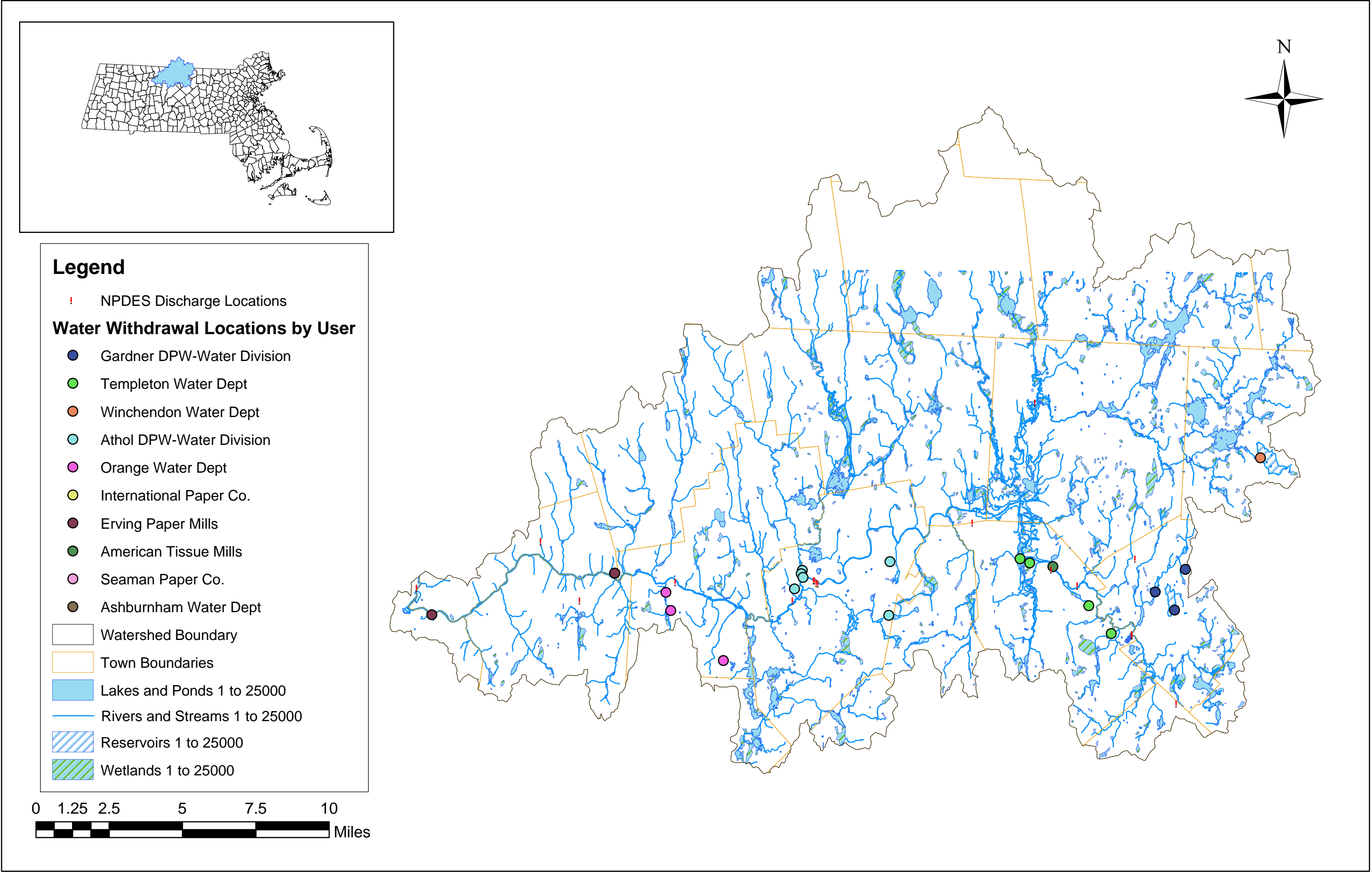
**Millers River Basin-Average Monthly Withdrawals and NPDES Discharges (Period of Record Varies)**



**FIGURE 6.3-4**

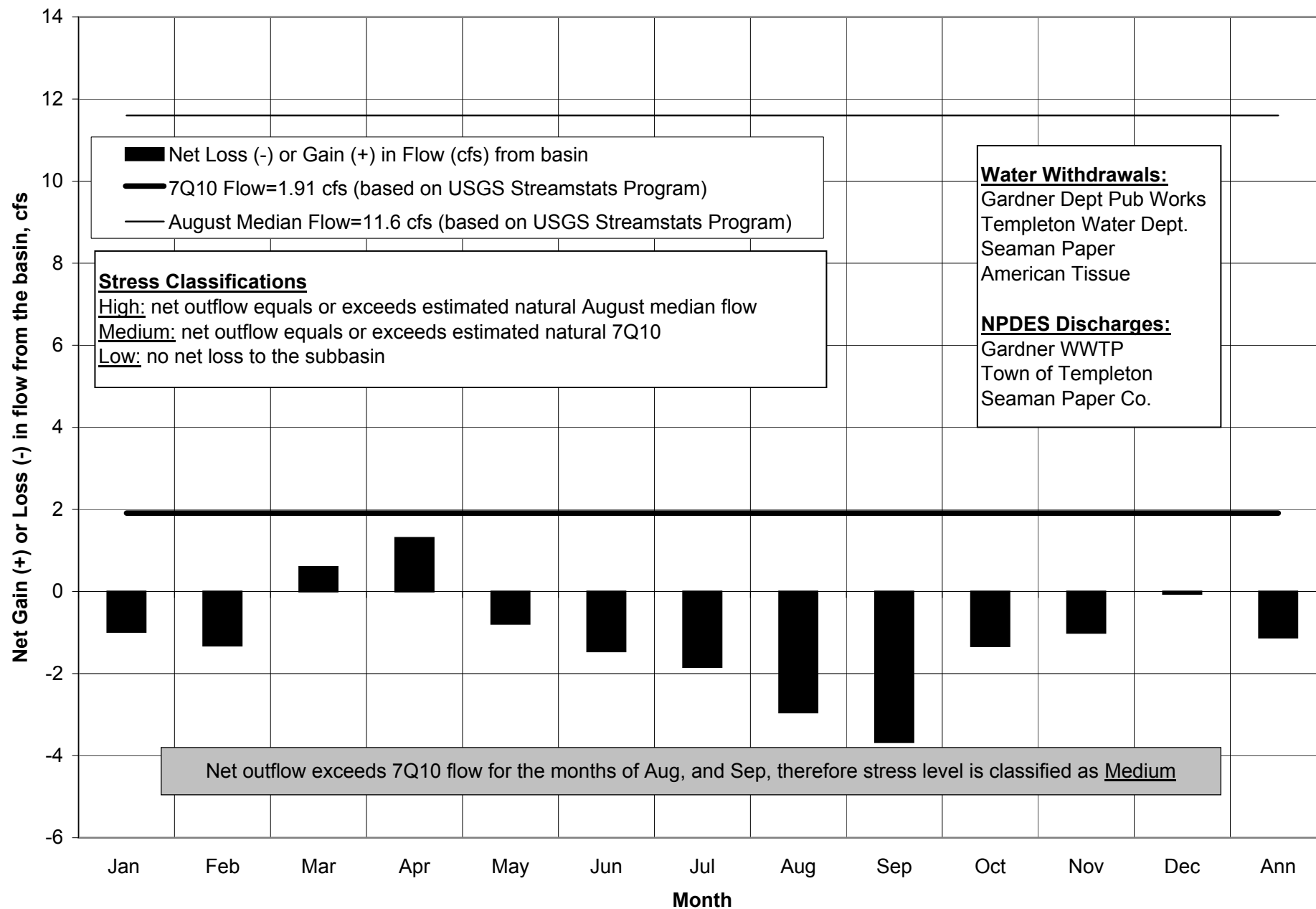
## **SECTION 7.0: FIGURES AND TABLES**

Figure 7.2-1 Water Withdrawals and NPDES Discharge Locations in the Millers River Basin





**Otter River Basin- Drainage Area= 60 sq mi, Net Average Monthly Gain (+) or Loss (-) of Water (in cfs) from the Otter River Basin due to Water Withdrawals (-) or WWTP Return Flows (+)**



**FIGURE 7.2-2**

Upper Naukeag Lake Basin- Drainage Area= 2 sq mi, Net Average Monthly Gain (+) or Loss (-) of Water (in cfs) from the Upper Naukeag Lake Basin due to Water Withdrawals (-) or WWTP Return Flows (+)

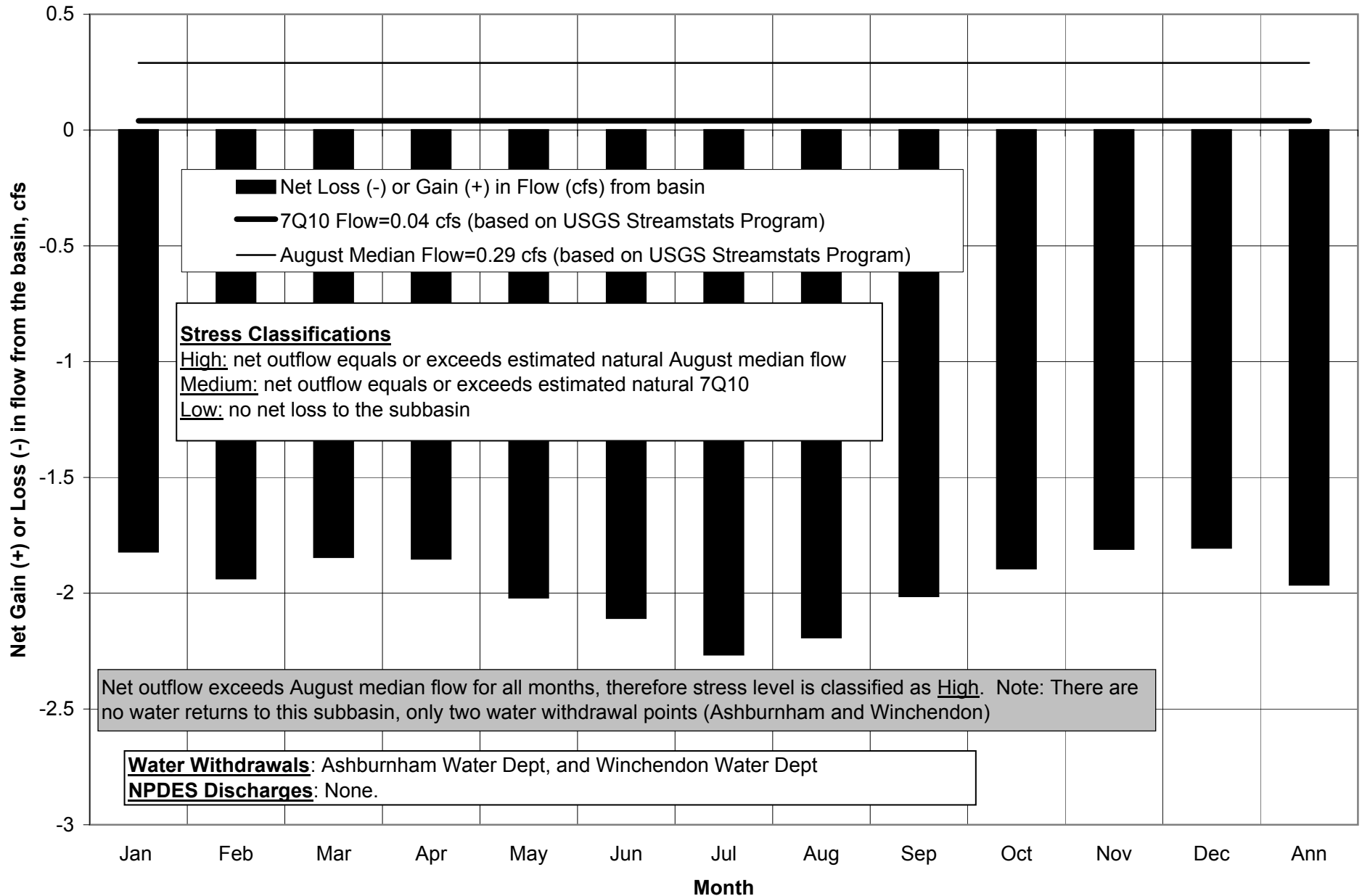
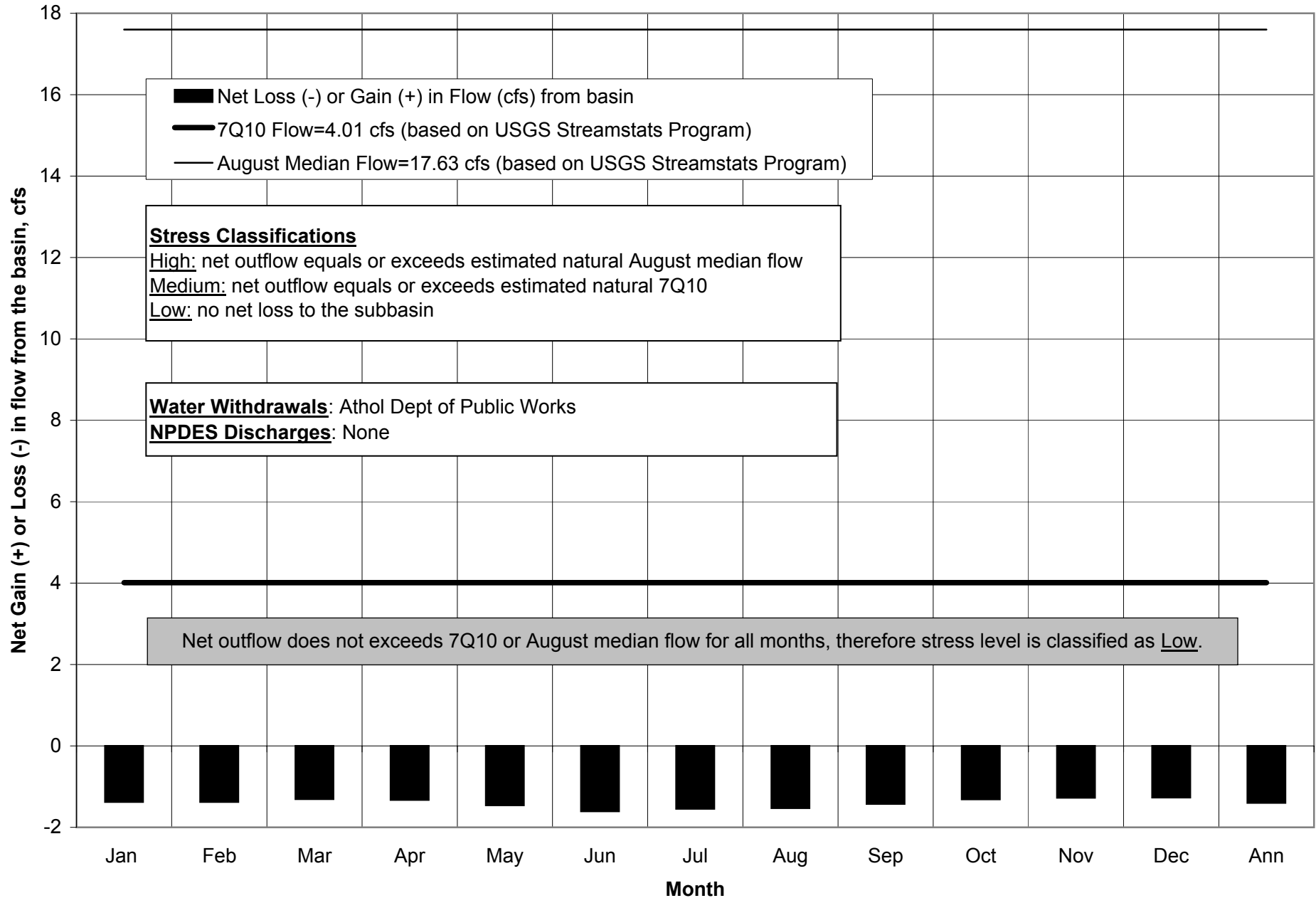


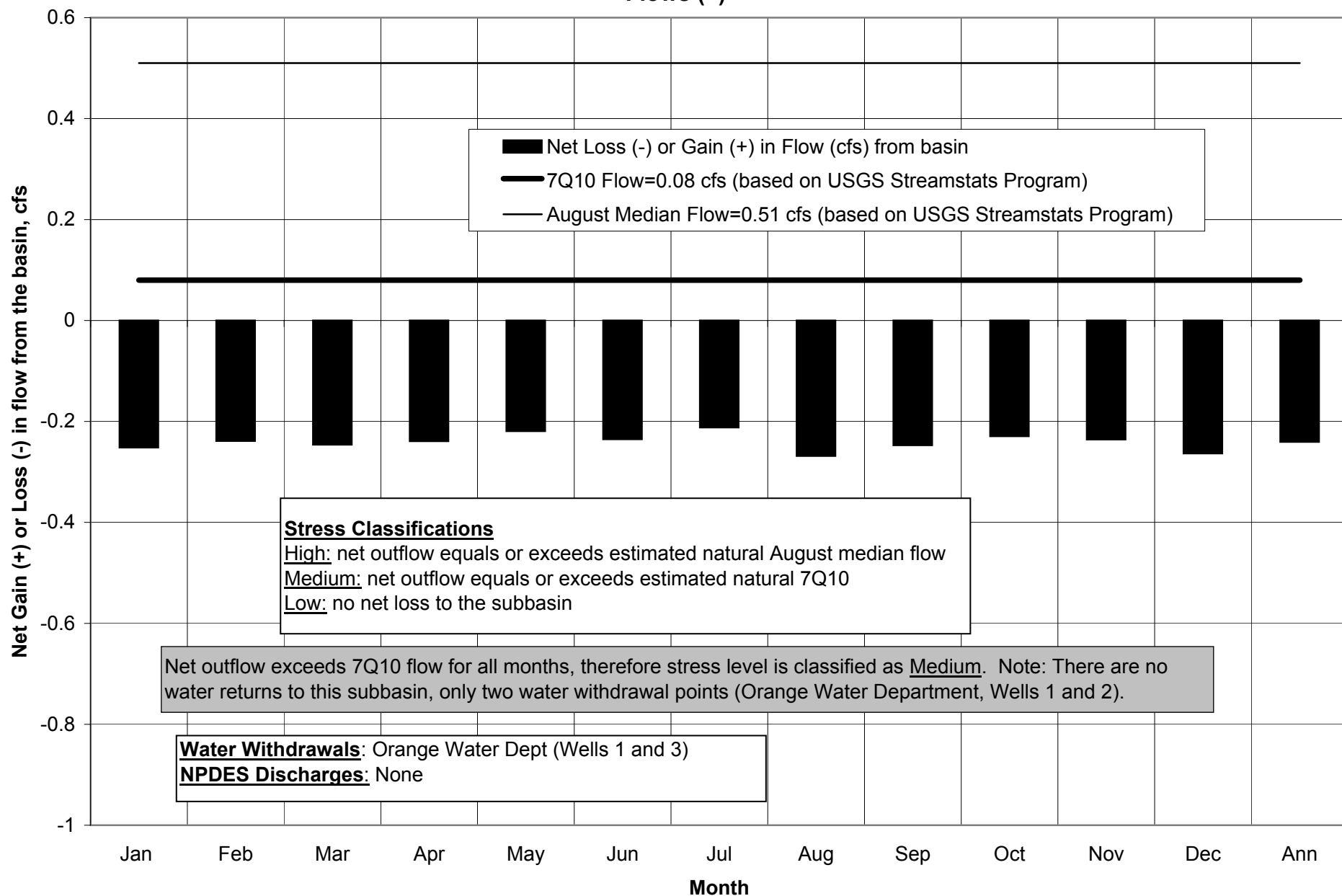
FIGURE 7.2-3

**Tully River Basin- Drainage Area= 72.80 sq mi, Net Average Monthly Gain (+) or Loss (-) of Water  
(in cfs) from the Tully River Basin due to Water Withdrawals (-) or WWTP Return Flows (+)**



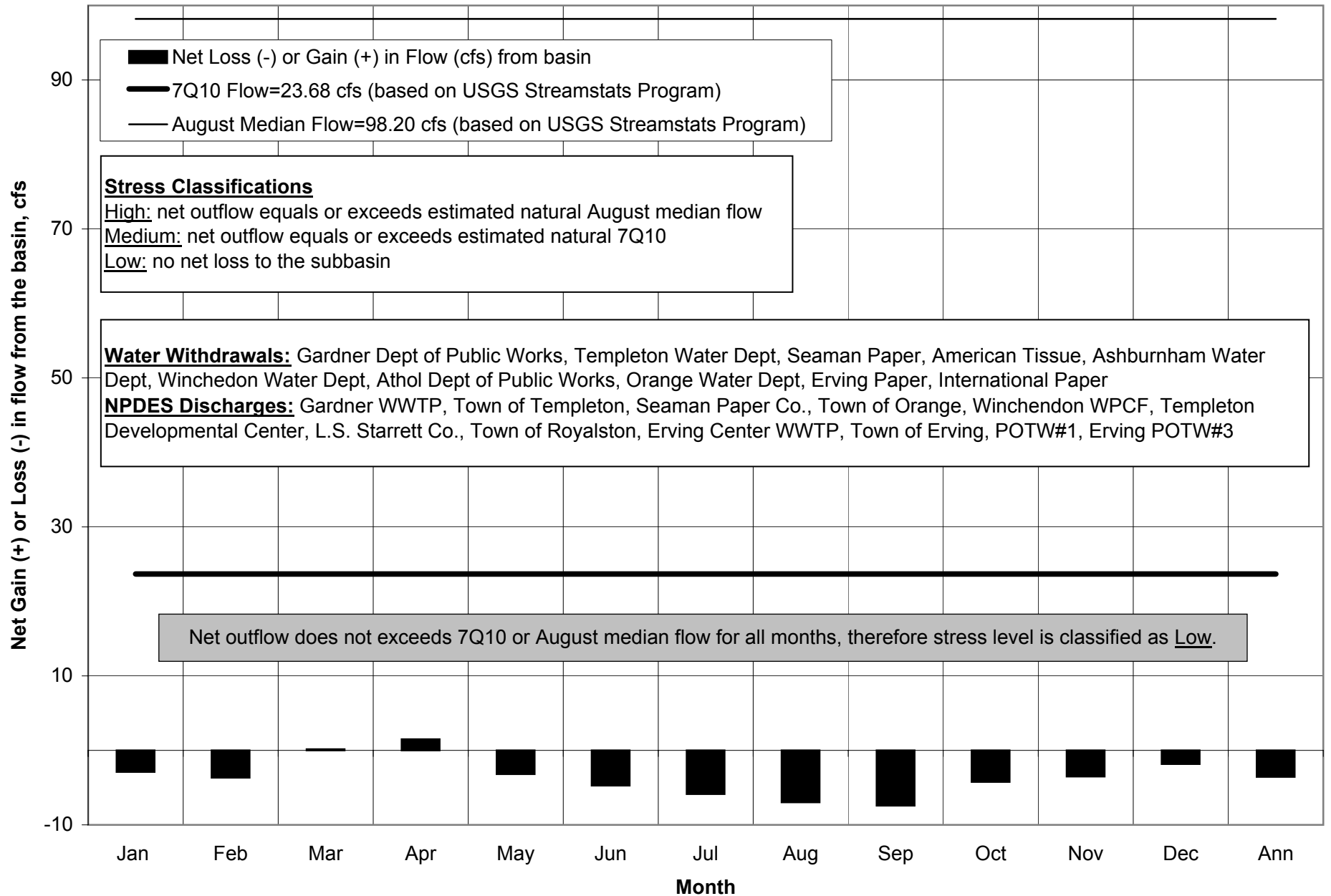
**FIGURE 7.2-4**

**North Pond Brook Basin- Drainage Area= 1.98 sq mi, Net Average Monthly Gain (+) or Loss (-) of Water (in cfs) from the North Pond Brook Basin due to Water Withdrawals (-) or WWTP Return Flows (+)**



**FIGURE 7.2-5**

**Millers River Basin- Drainage Area= 388.87 sq mi, Net Average Monthly Gain (+) or Loss (-) of Water (in cfs) from the Millers River Basin due to Water Withdrawals (-) or WWTP Return Flows (+)**

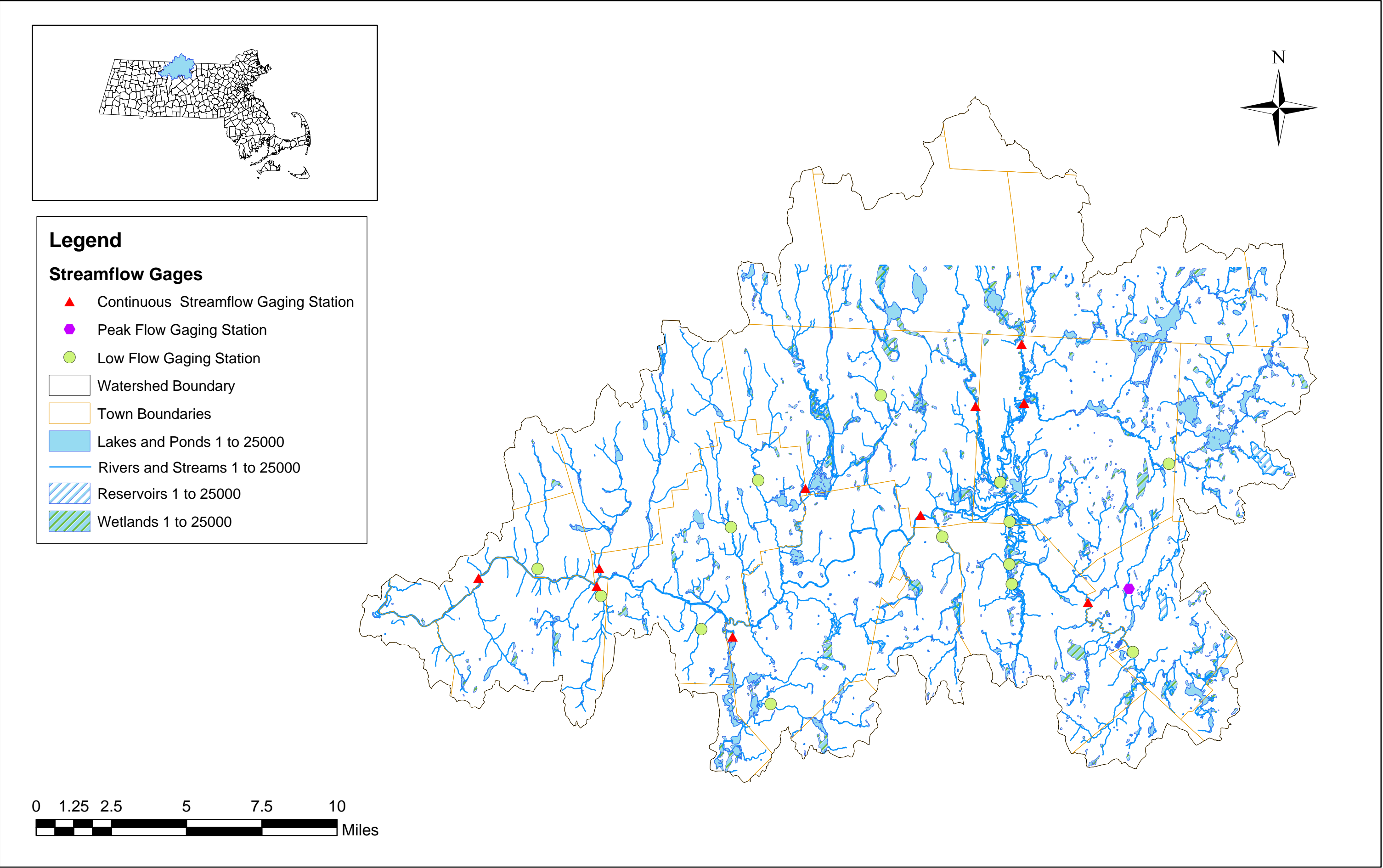


**FIGURE 7.2-6**

## **SECTION 8.0: FIGURES AND TABLES**



Figure 8.1-1: Location of USGS and Corps Flow Gages in the Millers River Basin

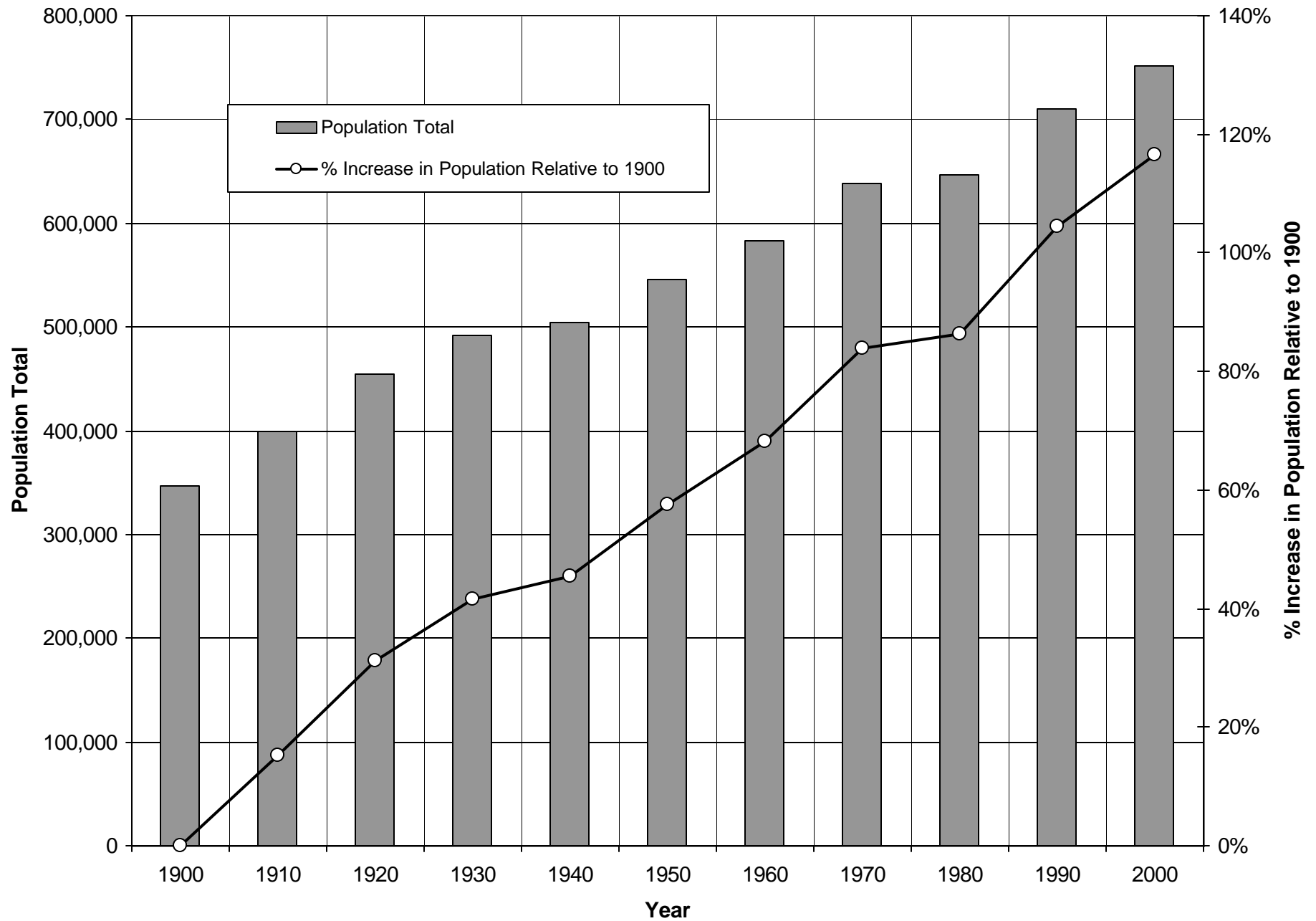


**FIGURE 8.3-1: Timeline of USGS Gage Data and Dam Construction in the Massachusetts portion of the Millers River Basin**

[illegible]

NOTE: There are other dams in the Millers River Basin, which were constructed in the late 1800's and early 1900's.

**Worcester County, Population Totals by Decade from 1900-2000**



**FIGURE 8.3-2**

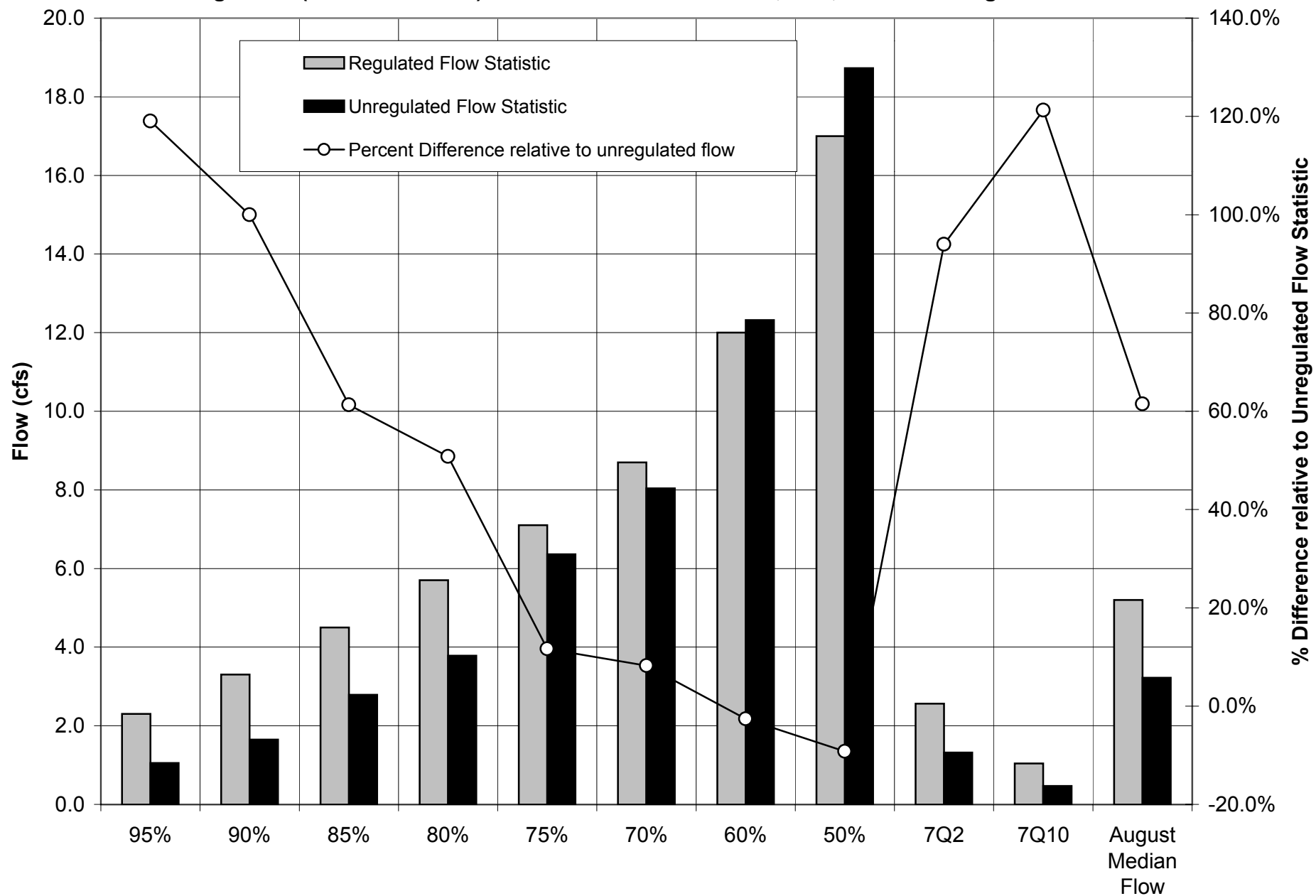
**Table 8.3-1. Comparison of Regulated and Unregulated Flow Conditions (using Streamstats)  
at USGS Gages in the Millers River Basin.**

Gage Name	Drainage Area	Period of Record	Estimated Streamflow (cfs)										August Median Flow
			95%	90%	85%	80%	75%	70%	60%	50%	7Q2	7Q10	
Tarbell Brook near Winchendon, MA	17.8 sq mi	Regulated 1916-1983	2.3	3.3	4.5	5.7	7.1	8.7	12.0	17.0	2.6	1.0	5.2
		Virgin or Unregulated	1.1	1.7	2.8	3.8	6.4	8.0	12.3	18.7	1.3	0.5	3.2
		% Difference	119.0%	100.0%	61.3%	50.8%	11.6%	8.2%	-2.6%	-9.2%	93.9%	121.3%	61.5%
Millers River near Winchendon, MA	81.8 sq mi	Regulated 1916-1999	12.0	18.0	25.0	33.0	41.0	50.0	67.0	89.0	14.1	6.8	29.0
		Virgin or Unregulated	6.9	10.0	16.0	20.6	33.1	41.0	59.8	85.9	8.3	3.4	18.1
		% Difference	73.4%	79.6%	56.4%	60.5%	23.8%	22.0%	12.1%	3.6%	70.7%	100.2%	60.7%
Priest Brook near Winchendon, MA	19.4 sq mi	Regulated 1916-1999	1.5	2.4	3.5	4.9	6.5	8.3	12.0	17.0	1.4	0.4	3.7
		Virgin or Unregulated	1.4	2.2	3.4	4.5	6.8	8.6	12.9	19.4	1.6	0.7	3.8
		% Difference	4.9%	10.6%	2.9%	9.9%	-4.6%	-3.0%	-7.0%	-12.5%	-14.9%	-33.0%	-2.4%
Otter River at Otter River, MA	34.1 sq mi	Regulated 1964-1999	8.1	11.0	14.0	17.0	20.0	23.0	31.0	41.0	8.0	4.6	15.0
		Virgin or Unregulated	2.9	4.4	6.8	9.0	13.9	17.0	24.0	34.6	3.5	1.4	7.8
		% Difference	177.4%	149.4%	104.7%	89.7%	44.4%	35.2%	29.0%	18.5%	132.6%	225.7%	91.6%
Millers River at South Royalston, MA	189 sq mi	Regulated 1942-1990	39.0	54.6	67.0	82.0	98.0	116.0	155.0	210.0	40.3	23.3	68.0
		Virgin or Unregulated	15.3	21.6	35.7	45.6	77.9	96.2	141.2	200.4	19.0	7.7	40.6
		% Difference	154.2%	152.5%	87.8%	79.7%	25.9%	20.6%	9.8%	4.8%	112.5%	201.6%	67.7%
E. Branch Tully River near Athol, MA	50.5 sq mi	Regulated 1950-1990	2.9	6.0	9.5	12.0	15.0	20.0	30.0	44.0	4.0	0.5	11.0
		Regulated 1917-1949	4.3	6.6	9.7	13.0	17.0	22.0	32.0	45.0	3.7	1.8	9.5
		Virgin or Unregulated	4.4	6.3	9.7	12.3	18.7	23.4	35.2	52.0	4.9	2.1	10.6
		% Difference (1950-90)	-33.6%	-4.9%	-2.1%	-2.8%	-19.6%	-14.3%	-14.7%	-15.3%	-17.0%	-75.0%	3.8%
Lake Rohunta Outlet near Athol, Ma	20.3 sq mi	Regulated 1964-1985	2.9	4.5	5.7	6.7	8.2	9.6	14.0	20.0	1.6	0.3	7.6
		Virgin or Unregulated	1.6	2.5	4.0	5.3	8.4	10.5	16.1	24.3	1.9	0.8	4.5
		% Difference	77.9%	82.2%	43.2%	27.4%	-1.8%	-8.8%	-13.0%	-17.7%	-14.6%	-54.8%	70.0%
Moss Brook at Wendell Depot, MA	12.1 sq mi	Regulated 1909-1982	1.2	1.7	2.3	3.0	3.9	4.8	7.4	10.0	1.2	0.6	2.3
		Virgin or Unregulated	1.2	1.8	2.6	3.3	4.3	5.4	8.1	12.2	1.2	0.6	2.7
		% Difference	-1.6%	-6.6%	-10.2%	-7.7%	-9.1%	-10.8%	-8.1%	-17.8%	-4.1%	6.9%	-15.4%
Whetstone Brook at Depot Rd at Wendell Depot, MA	5.22 sq mi	Regulated 1985-1991	1.5	2.0	2.4	2.9	3.4	3.9	5.0	6.2	period too short		2.5
		Virgin or Unregulated	0.4	0.7	1.0	1.2	1.6	2.1	3.3	5.2	0.4	0.2	1.0
		% Difference	240.9%	198.5%	150.0%	133.9%	108.6%	86.6%	52.9%	20.2%			147.5%
Millers River at Erving, MA	372 sq mi	Regulated 1950-1998	75.0	101.0	128.0	156.0	187.0	220.0	300.0	409.0	80.1	46.0	74.6
		Regulated 1916-1950	81.0	110.0	137.0	165.0	195.0	225.0	300.0	390.0	87.5	49.4	94.8
		Virgin or Unregulated	39.7	53.0	82.5	101.4	162.0	198.8	287.8	400.3	45.8	21.2	90.8
		% Difference (1950-98)	89.1%	90.5%	55.1%	53.9%	15.4%	10.7%	4.2%	2.2%	75.1%	117.1%	-17.8%

**Notes:**

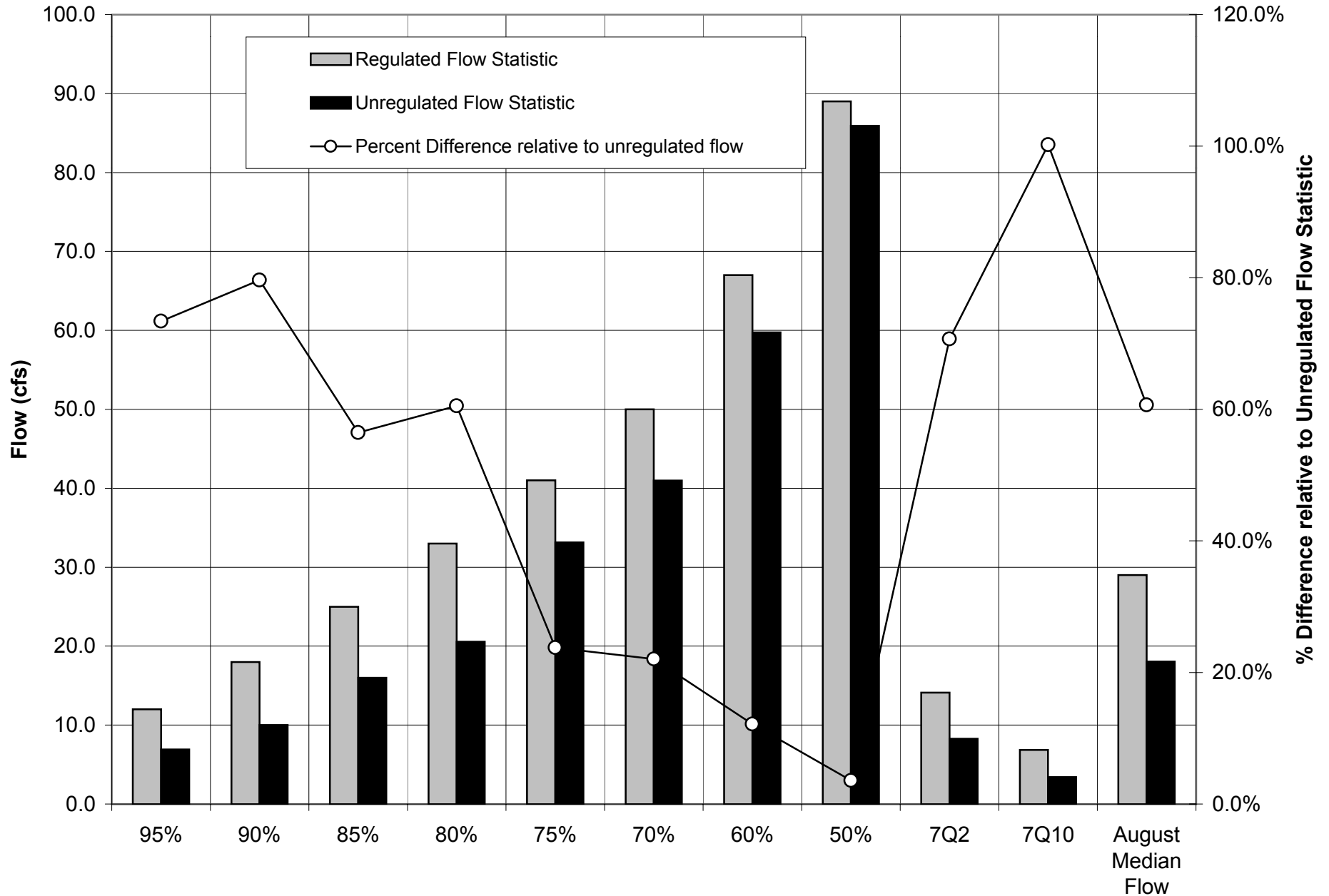
- 1) The regulated 95%, 90%, 85%, 75%, 70%, 60% and 50% exceedence flows were based on annual flow duration analysis using mean daily flow data
- 2) The regulated 7Q2 and 7Q10 were computed using Log-Pearson Type III Distribution, the same method used in the Streamstats program. The period of record used to compute the regulated 7Q2/7Q10 is based on a continuous period of flow record for a calendar year. Thus, the period of record may be slightly shorter than shown in Column 3.
- 3) The regulated August median flow was computed as the median of the mean August daily flows, the same method used in the Streamstats program.
- 4) All of the unregulated flow statistics obtained from Streamstats have 90% Prediction Intervals (but are not shown)
- 5) For the East Branch of the Tully River and Millers River at Erving, the regulated flow was computed for two periods of record (before and after the Birch Hill and Tully Flood Control Facilities were constructed). Percent Differences between regulated and unregulated conditions is relative to unregulated conditions.  
For example, the regulated (post dam) and virgin 95% exceedence flow for the Millers River at Erving is 75 cfs and 39.7 cfs, respectively. The percent difference =  $(75-39.7)/39.7=89.1\%$ .

**Tarbell Brook near Winchendon, MA (Drainage Area= 17.8 sq mi), Comparison of Regulated versus Unregulated (via Streamstats) Annual Exceedence Flows, 7Q2, 7Q10 and August Median Flow**



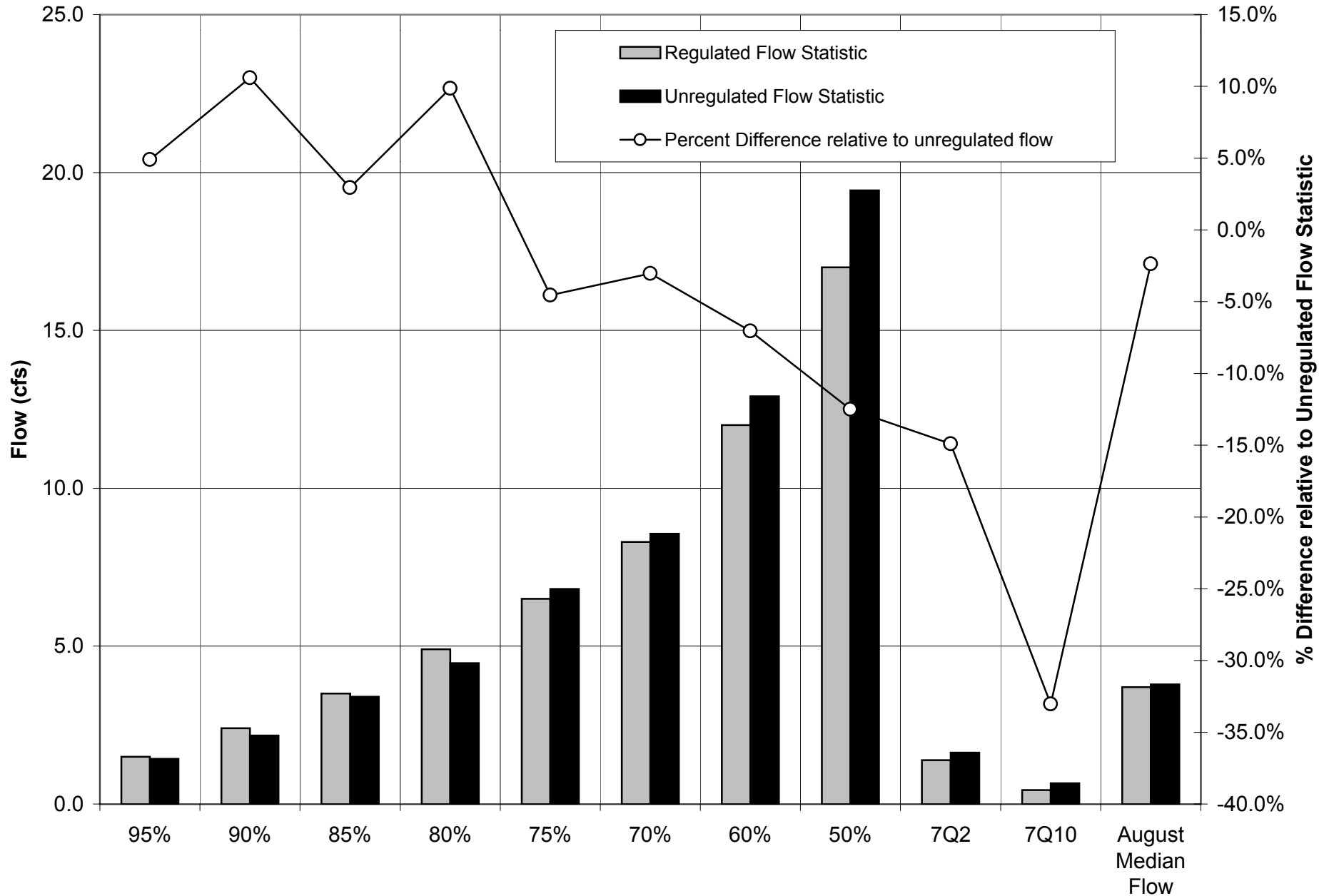
**FIGURE 8.3-3**

**Millers River near Winchendon, MA (Drainage Area= 81.8 sq mi), Comparison of Regulated versus Unregulated (via Streamstats) Annual Exceedence Flows, 7Q2, 7Q10 and August Median Flow**



**FIGURE 8.3-4**

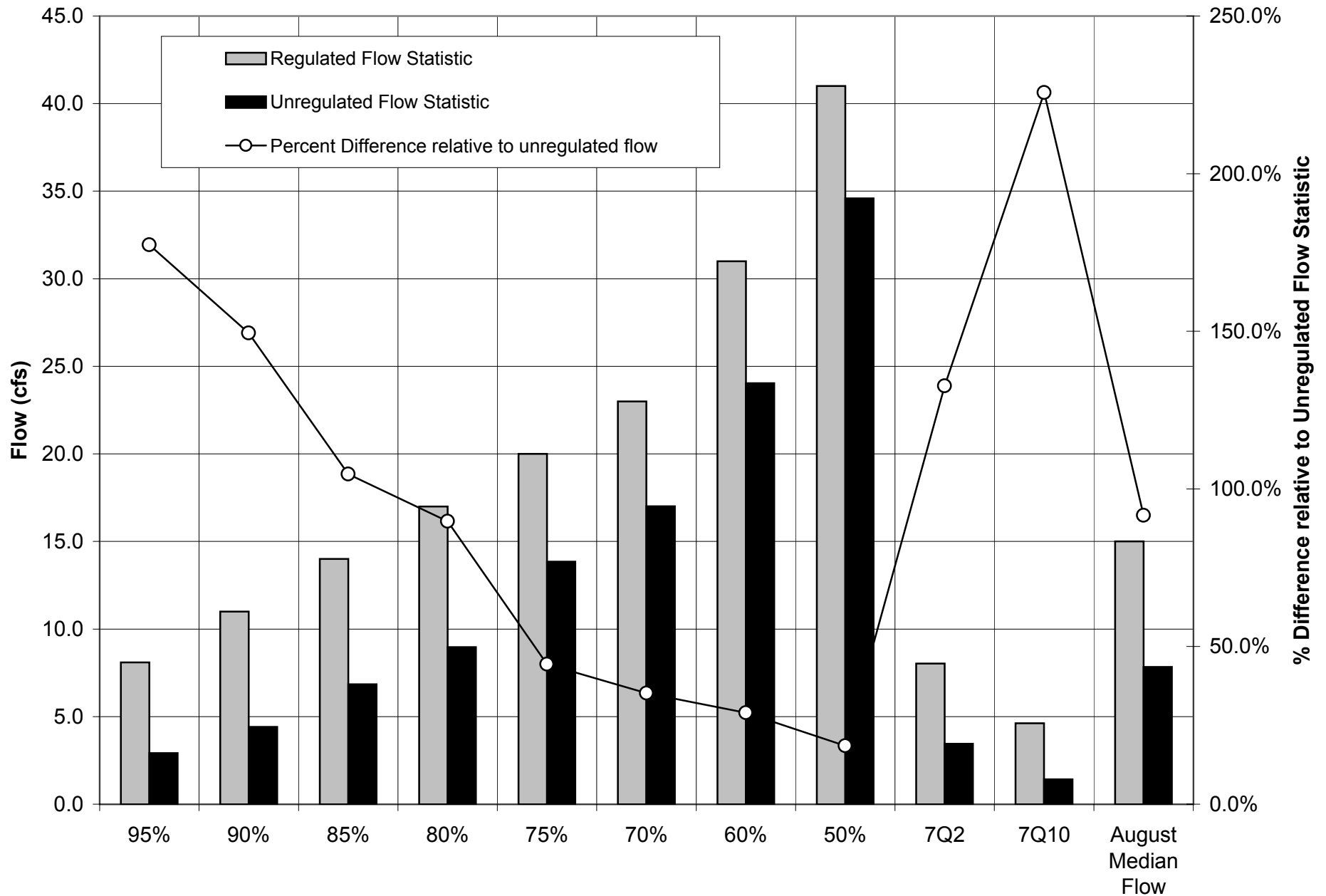
**Priest Brook near Winchendon, MA (Drainage Area= 19.4 sq mi), Comparison of Regulated versus Unregulated (via Streamstats) Annual Exceedence Flows, 7Q2, 7Q10 and August Median Flow**



**FIGURE 8.3-5**

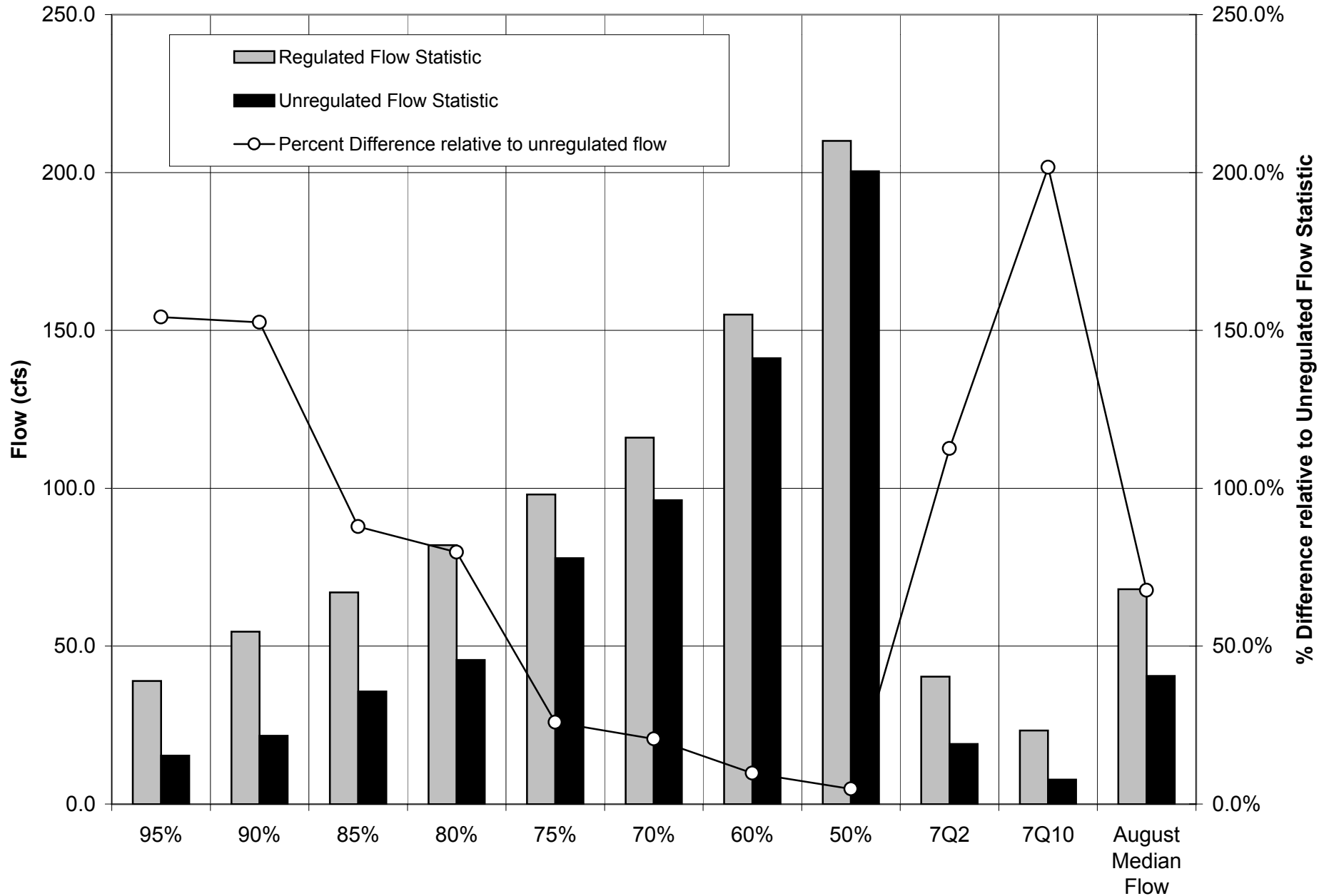


**Otter River at Otter River, MA (Drainage Area= 34.1 sq mi), Comparison of Regulated versus Unregulated (via Streamstats) Annual Exceedence Flows, 7Q2, 7Q10 and August Median Flow**



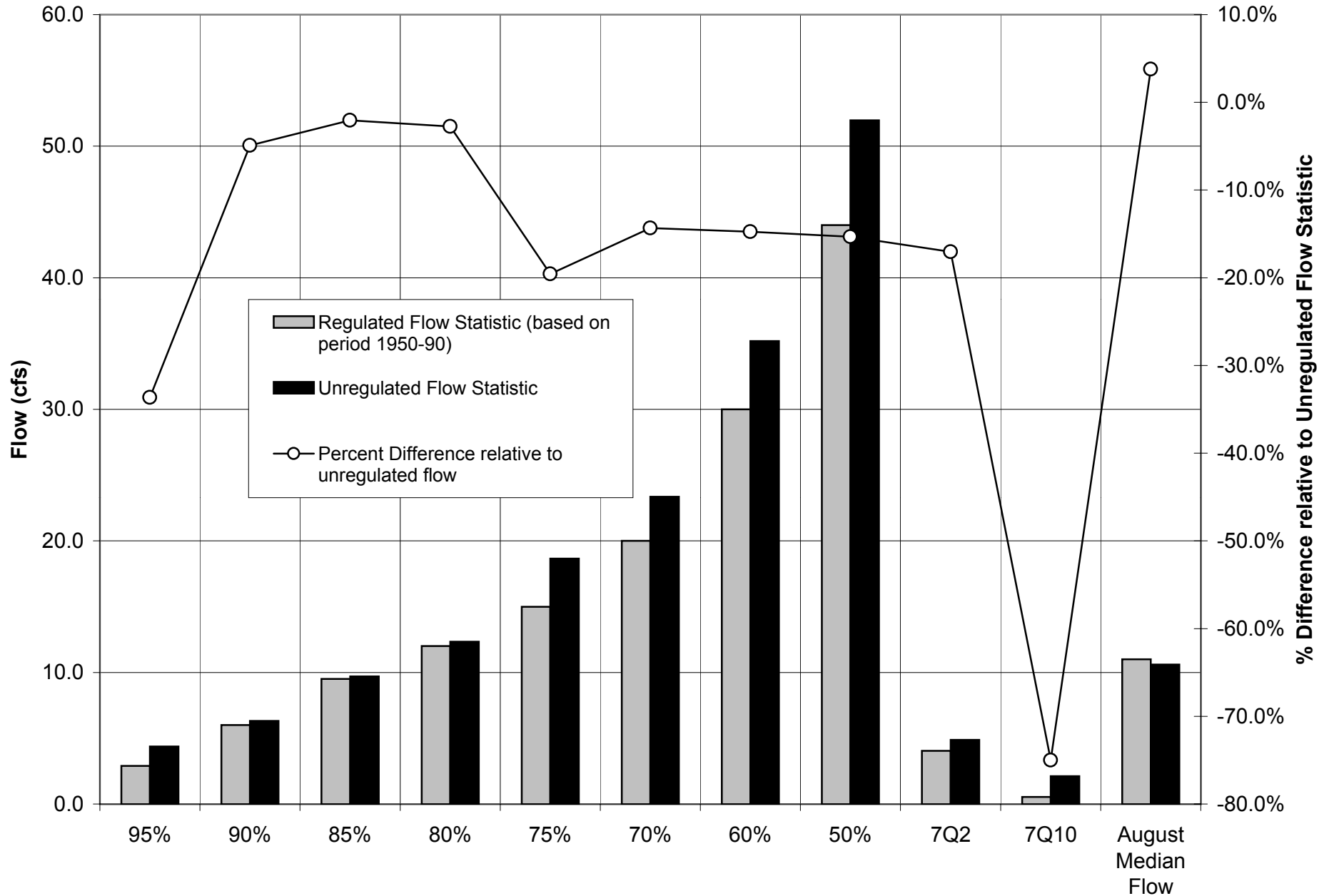
**FIGURE 8.3-6**

**Millers River at South Royalston, MA (Drainage Area= 189 sq mi), Comparison of Regulated versus Unregulated (via Streamstats) Annual Exceedence Flows, 7Q2, 7Q10 and August Median Flow**



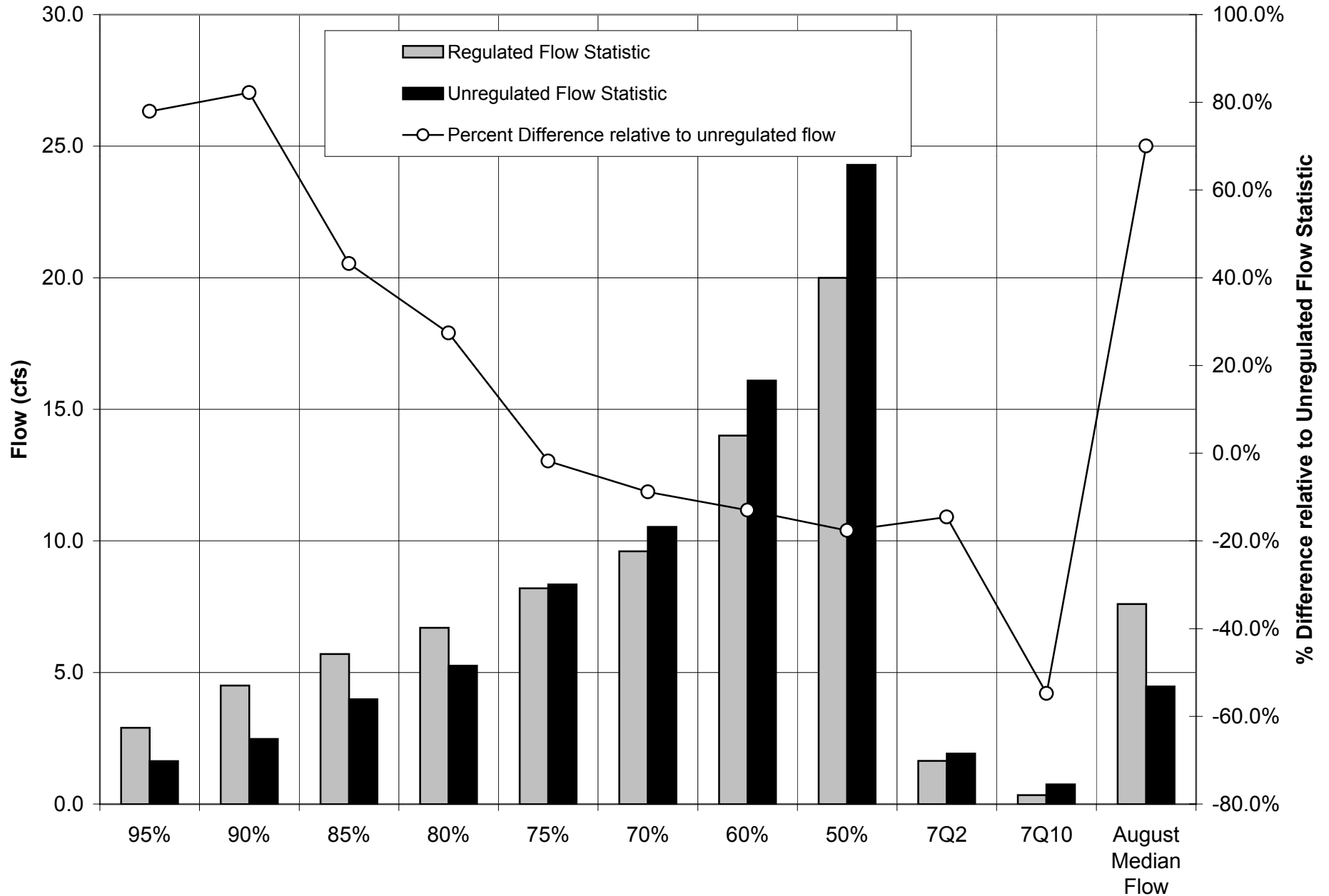
**FIGURE 8.3-7**

**East Br. Tully River near Athol, MA (Drainage Area= 50.5 sq mi), Comparison of Regulated versus Unregulated (via Streamstats) Annual Exceedence Flows, 7Q2, 7Q10 and August Median Flow**



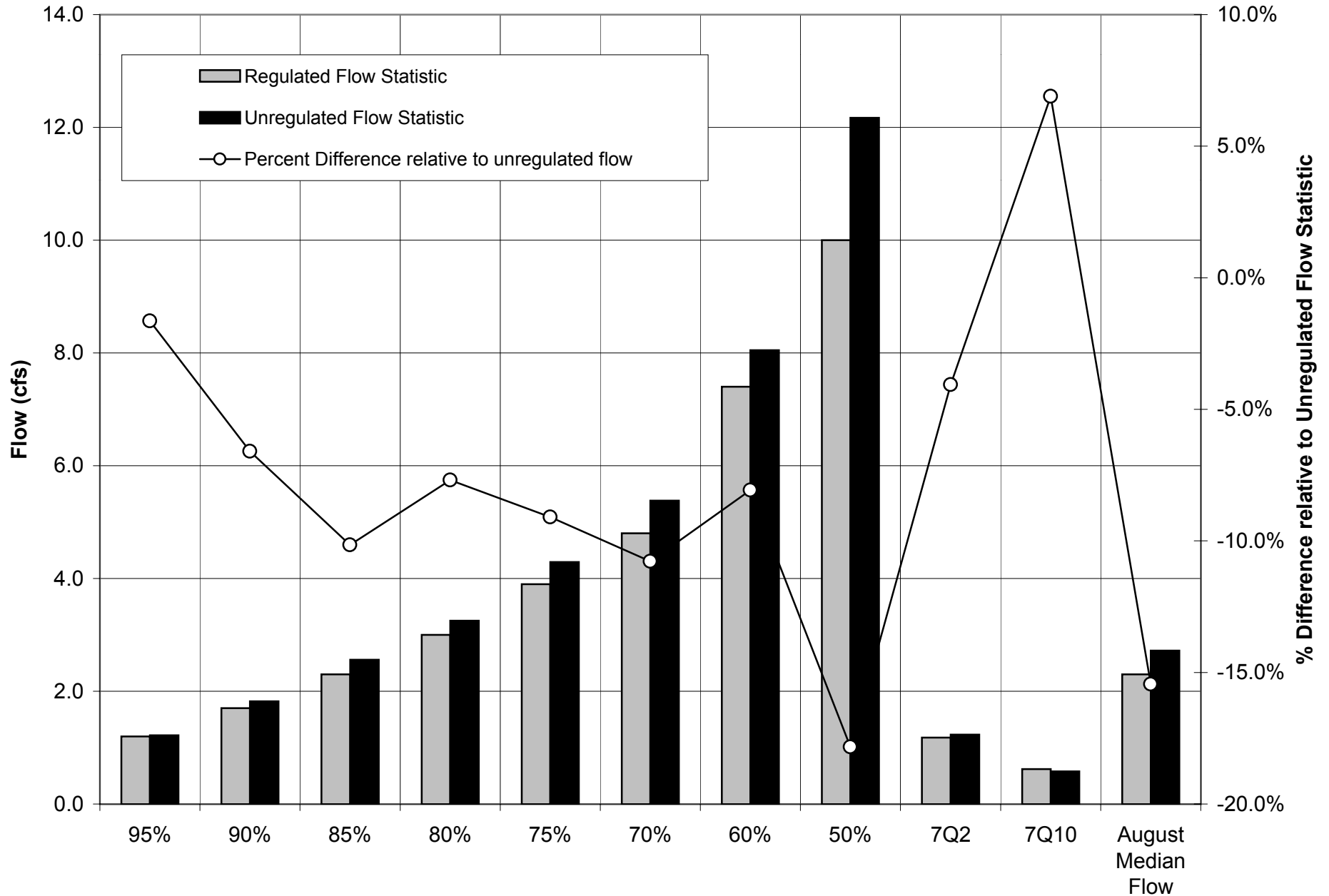
**FIGURE 8.3-8**

**Lake Rohunta Outlet near Athol, MA (Drainage Area= 20.3 sq mi), Comparison of Regulated versus Unregulated (via Streamstats) Annual Exceedence Flows, 7Q2, 7Q10 and August Median Flow**



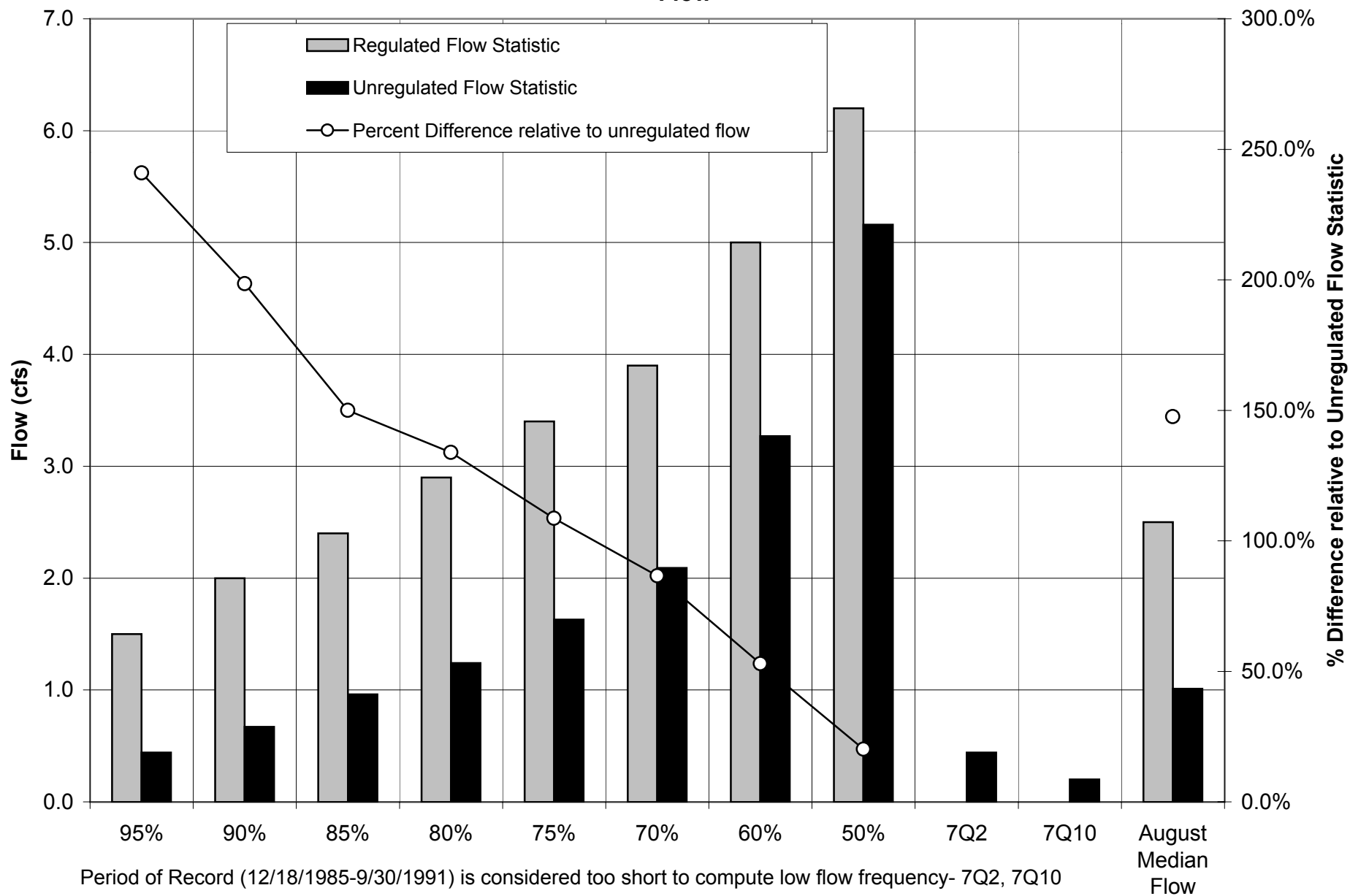
**FIGURE 8.3-9**

**Moss Brook at Wendell Depot, MA (Drainage Area= 12.1 sq mi), Comparison of Regulated versus Unregulated (via Streamstats) Annual Exceedence Flows, 7Q2, 7Q10 and August Median Flow**



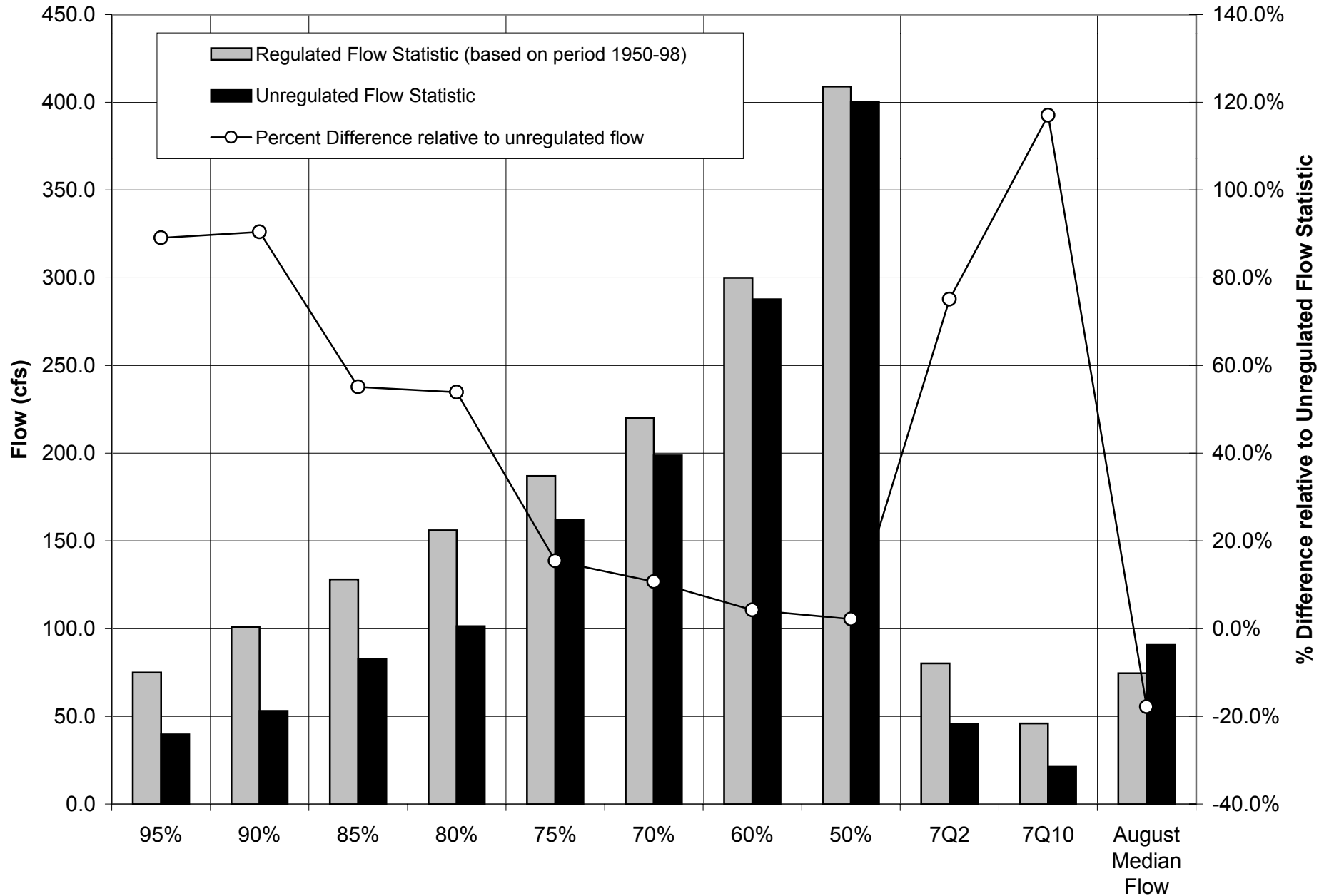
**FIGURE 8.3-10**

**Whetstone Brook at Wendell Depot, MA (Drainage Area= 5.22 sq mi), Comparison of Regulated versus Unregulated (via Streamstats) Annual Exceedence Flows, 7Q2, 7Q10 and August Median Flow**



**FIGURE 8.3-11**

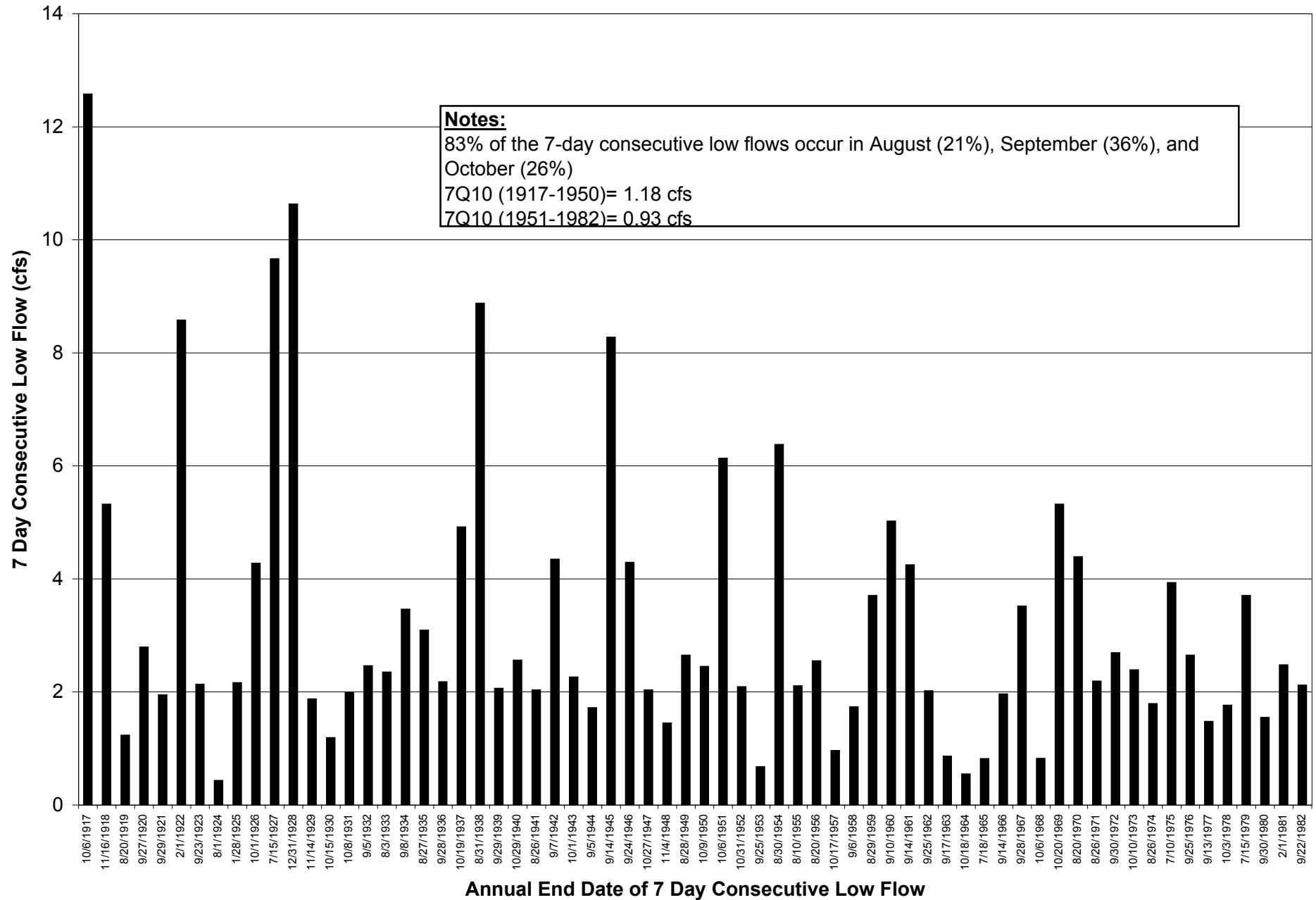
**Millers River at Erving, MA (Drainage Area= 372 sq mi), Comparison of Regulated versus Unregulated (via Streamstats) Annual Exceedence Flows, 7Q2, 7Q10 and August Median Flow**



**FIGURE 8.3-12**

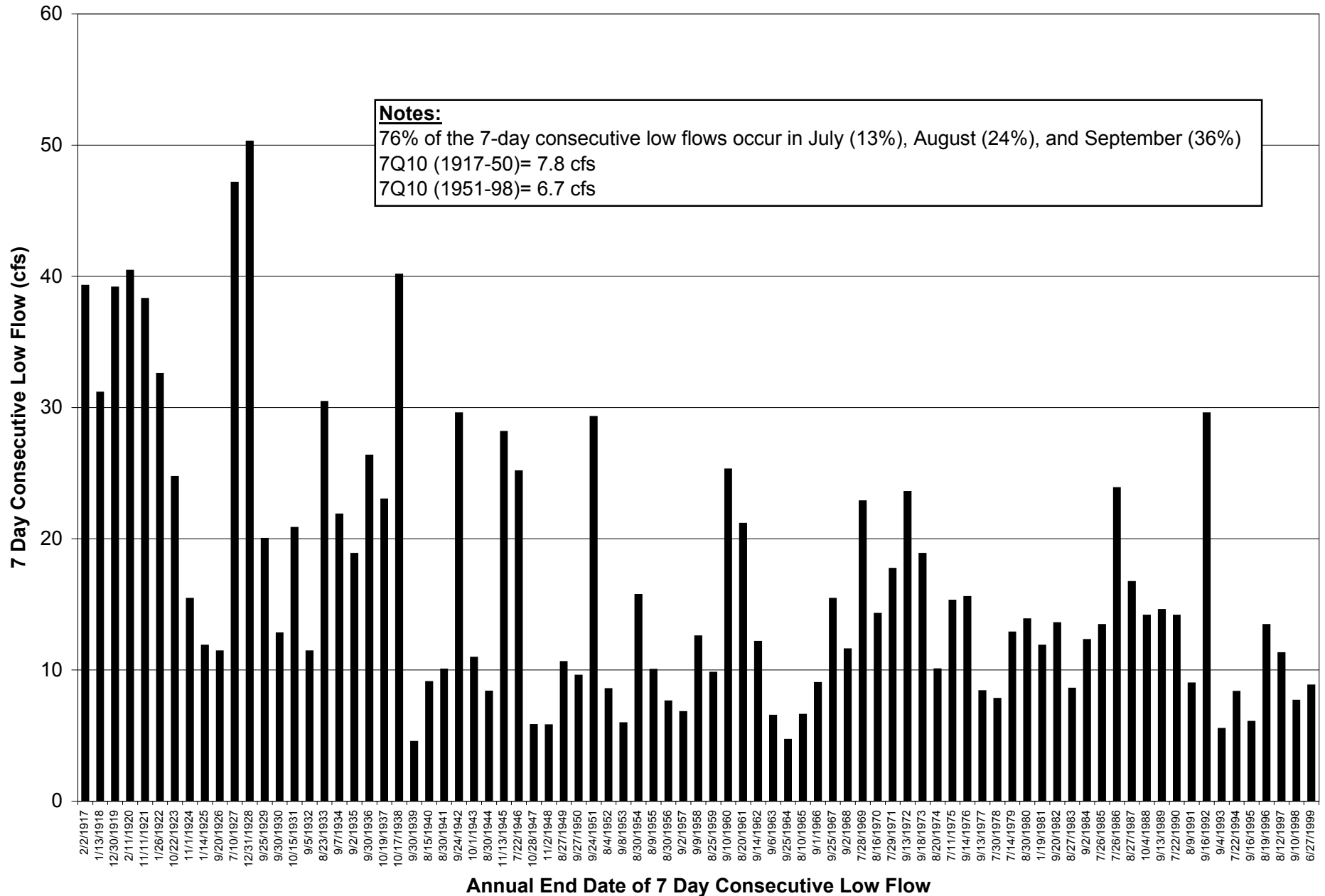


**Tarbell Brook near Winchendon, MA, Annual 7 Day Consecutive Low Flow,  
Drainage Area= 17.8 square miles**



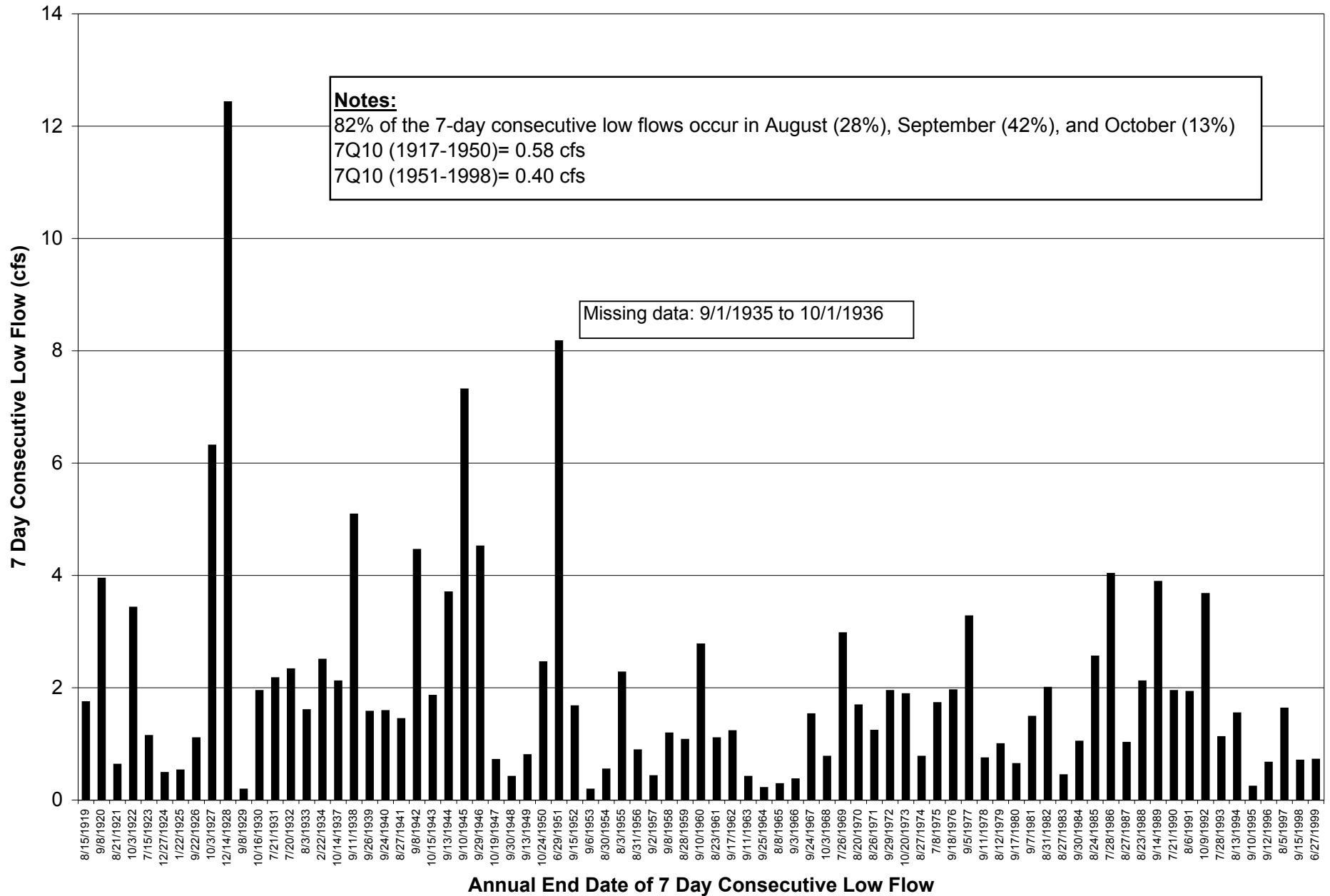
**FIGURE 8.4.1-1**

**Millers River near Winchendon, MA, Annual 7 Day Consecutive Low Flow,  
Drainage Area= 81.8 square miles**



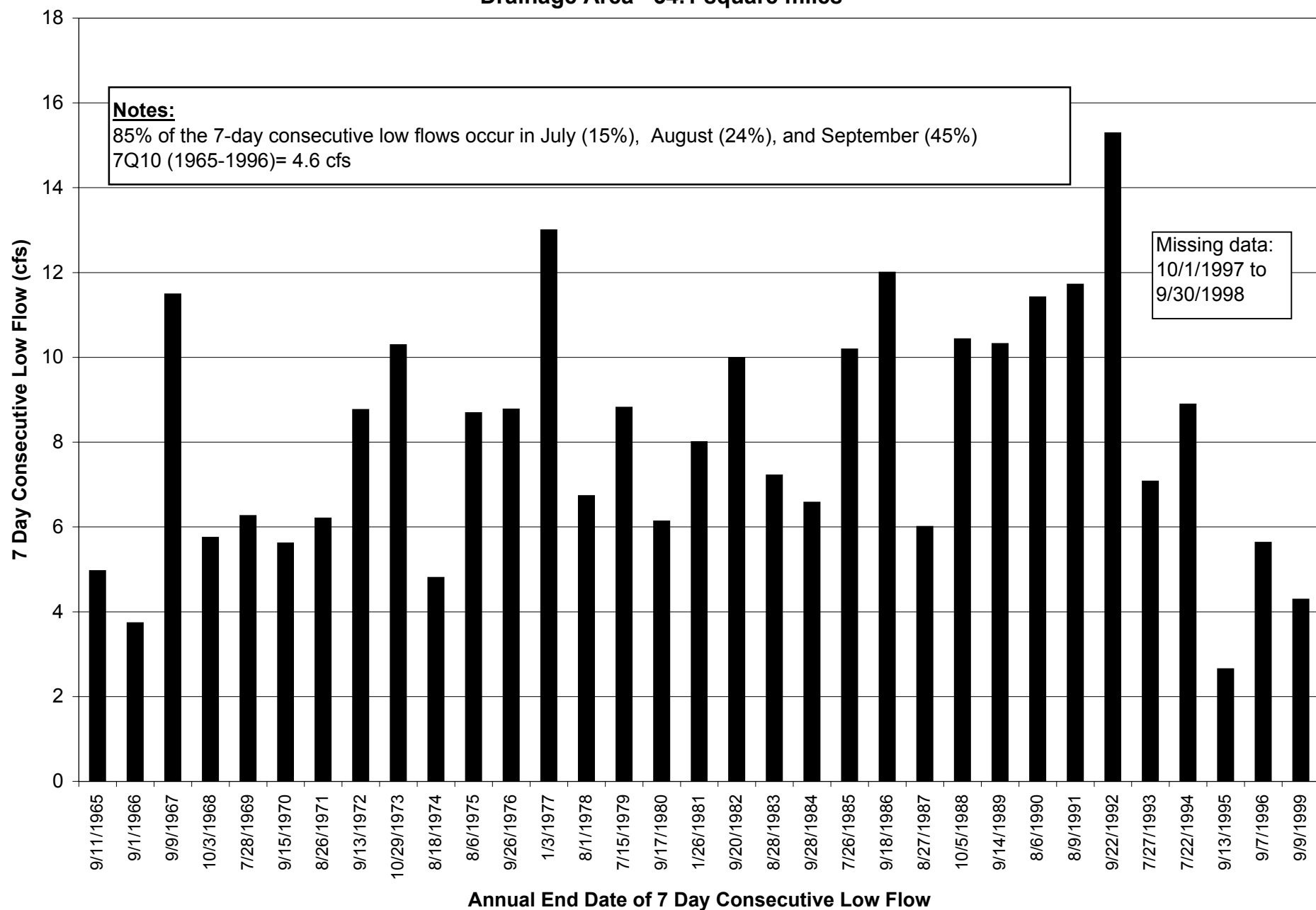
**FIGURE 8.4.1-2**

**Priest Brook near Winchendon, MA, Annual 7 Day Consecutive Low Flow,  
Drainage Area= 19.4 square miles**



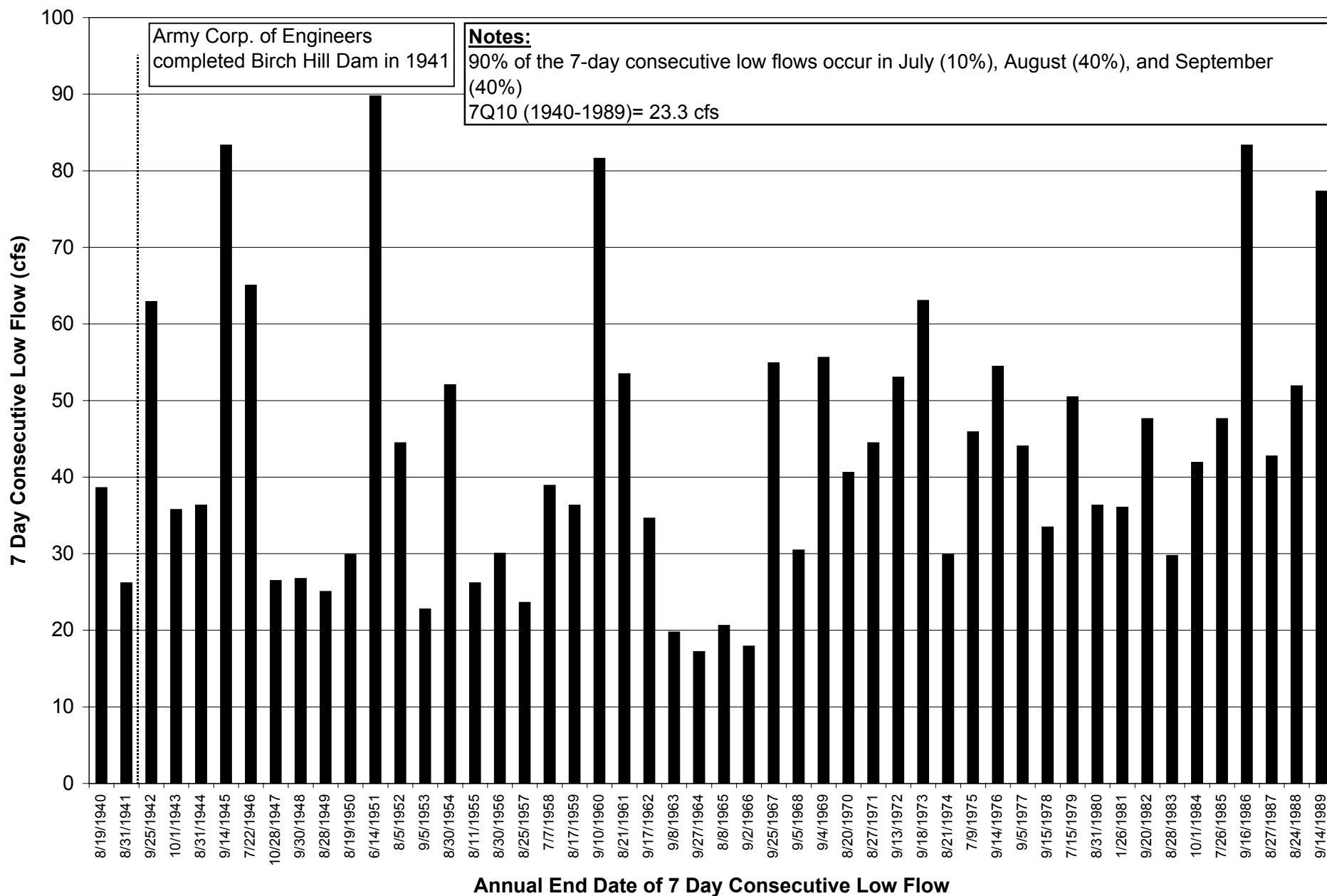
**FIGURE 8.4.1-3**

**Otter River at Otter River, MA, Annual 7 Day Consecutive Low Flow,  
Drainage Area= 34.1 square miles**



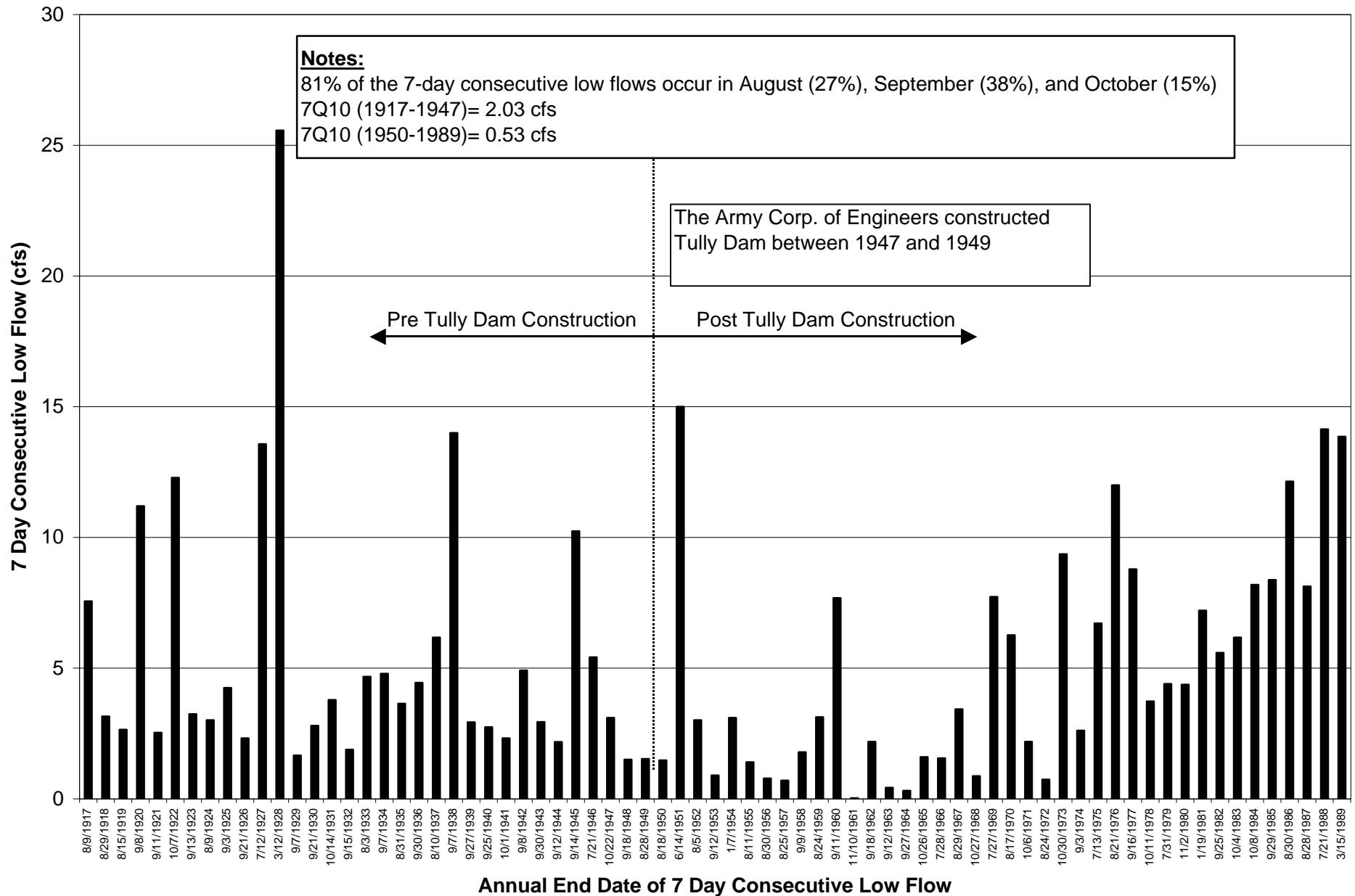
**FIGURE 8.4.1-4**

**Millers River at South Royalston, MA, Annual 7 Day Consecutive Low Flow,  
Drainage Area= 189 square miles**



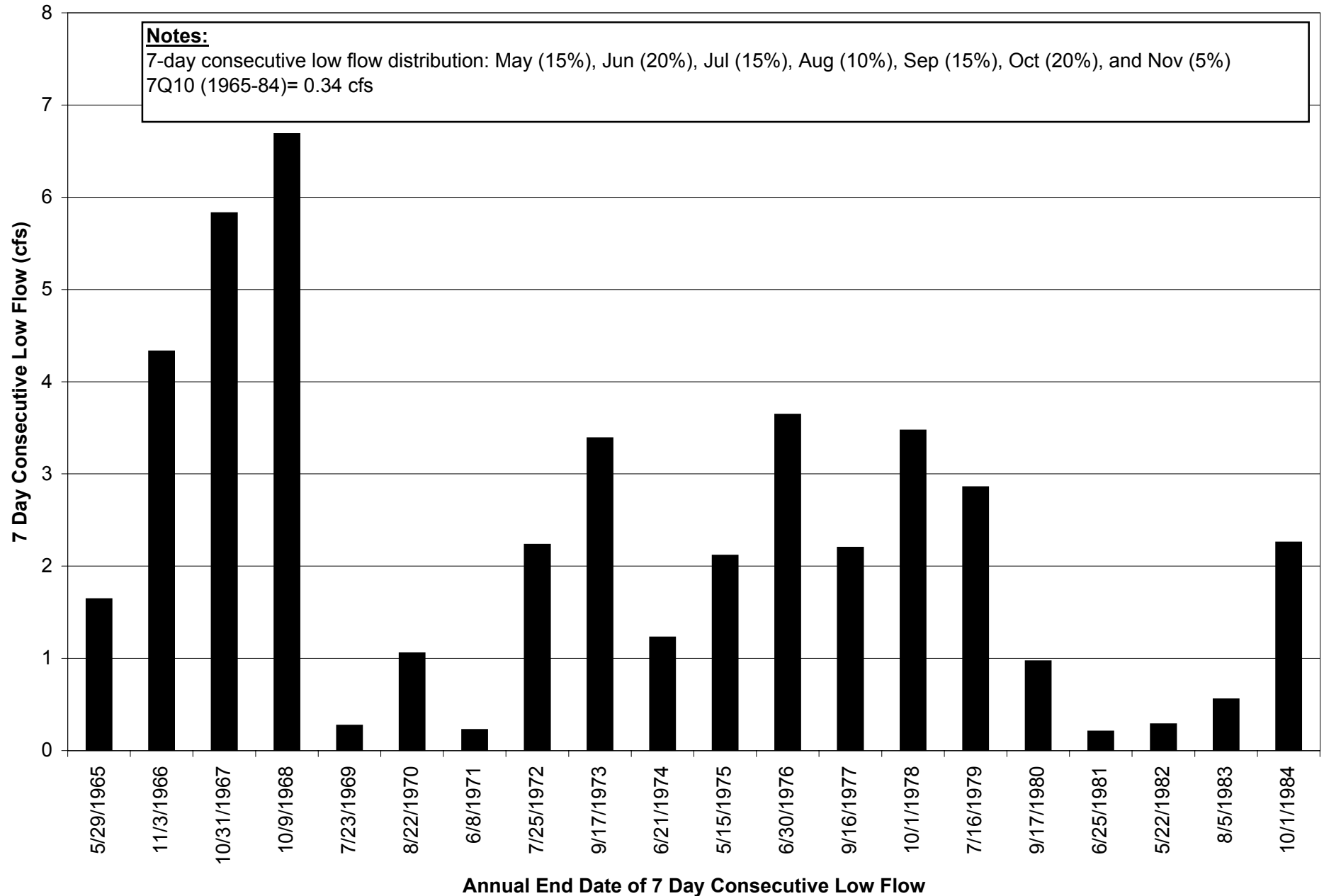
**FIGURE 8.4.1-5**

**East Branch Tully River near Athol, MA, Annual 7 Day Consecutive Low Flow,  
Drainage Area= 50.5 square miles**



**FIGURE 8.4.1-6**

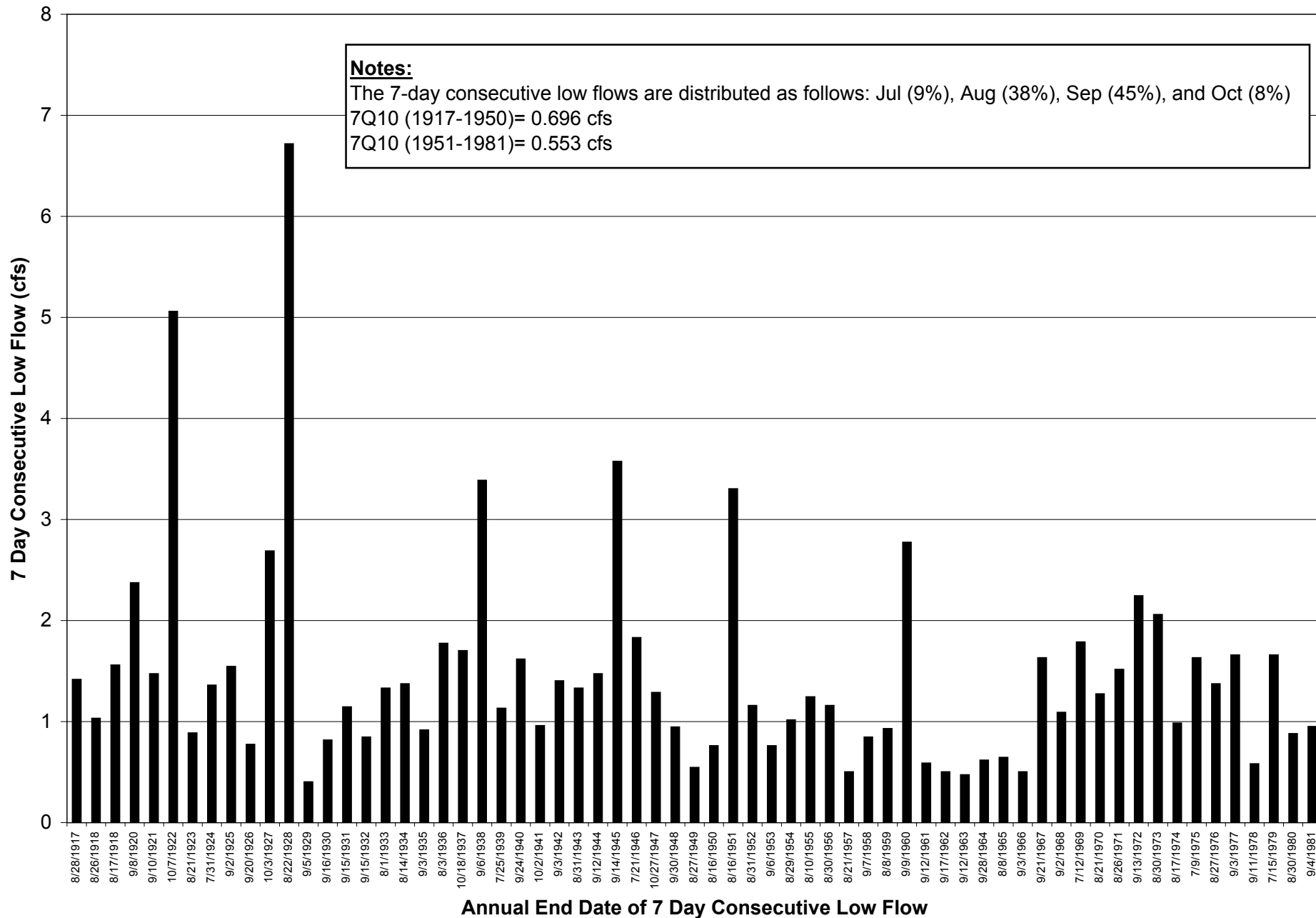
**Lake Rohunta Outlet near Athol, MA, Annual 7 Day Consecutive Low Flow,  
Drainage Area= 20.3 square miles**



**FIGURE 8.4.1-7**

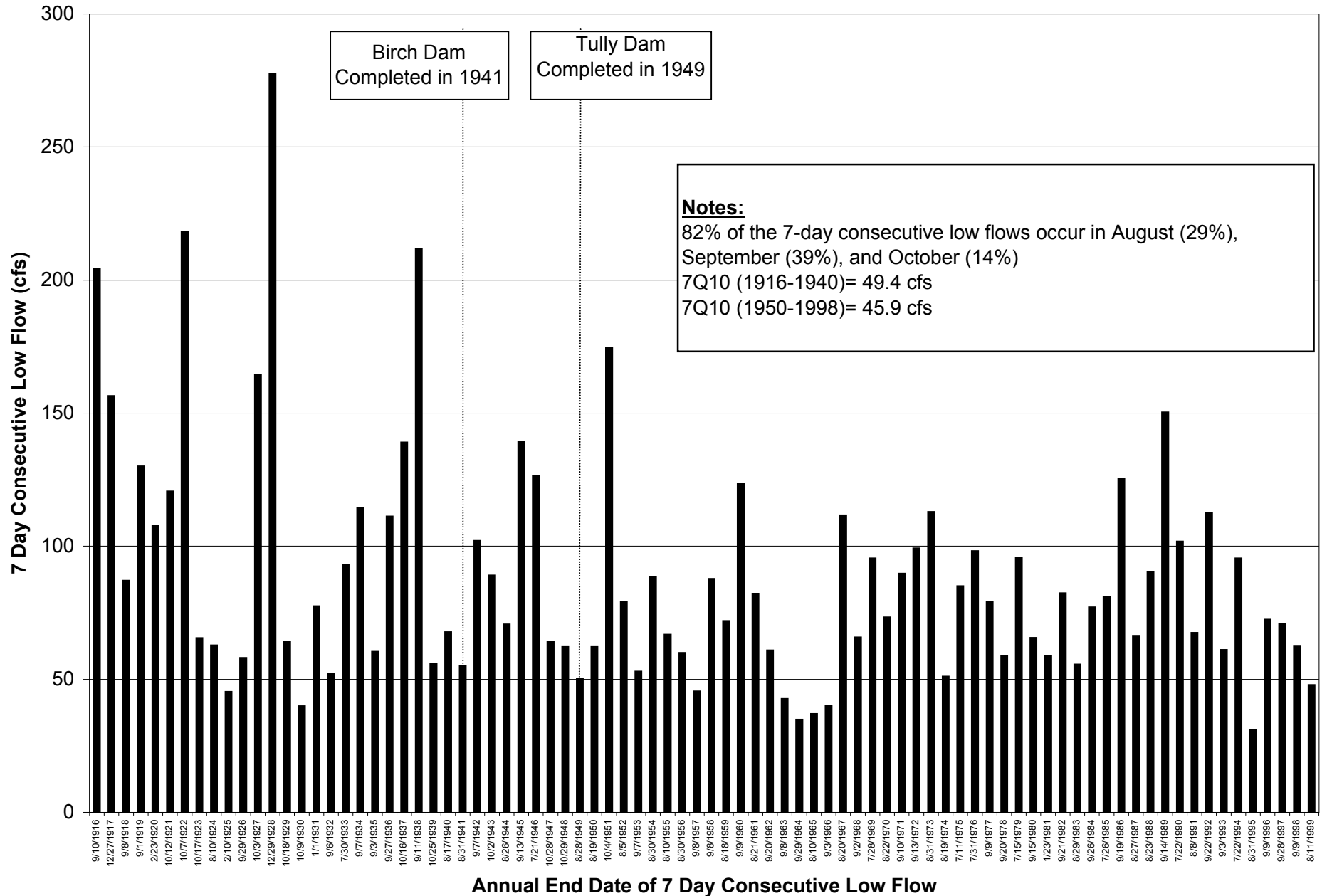


**Moss Brook at Wendell Depot, MA, Annual 7 Day Consecutive Low Flow,  
Drainage Area= 12.1 square miles**



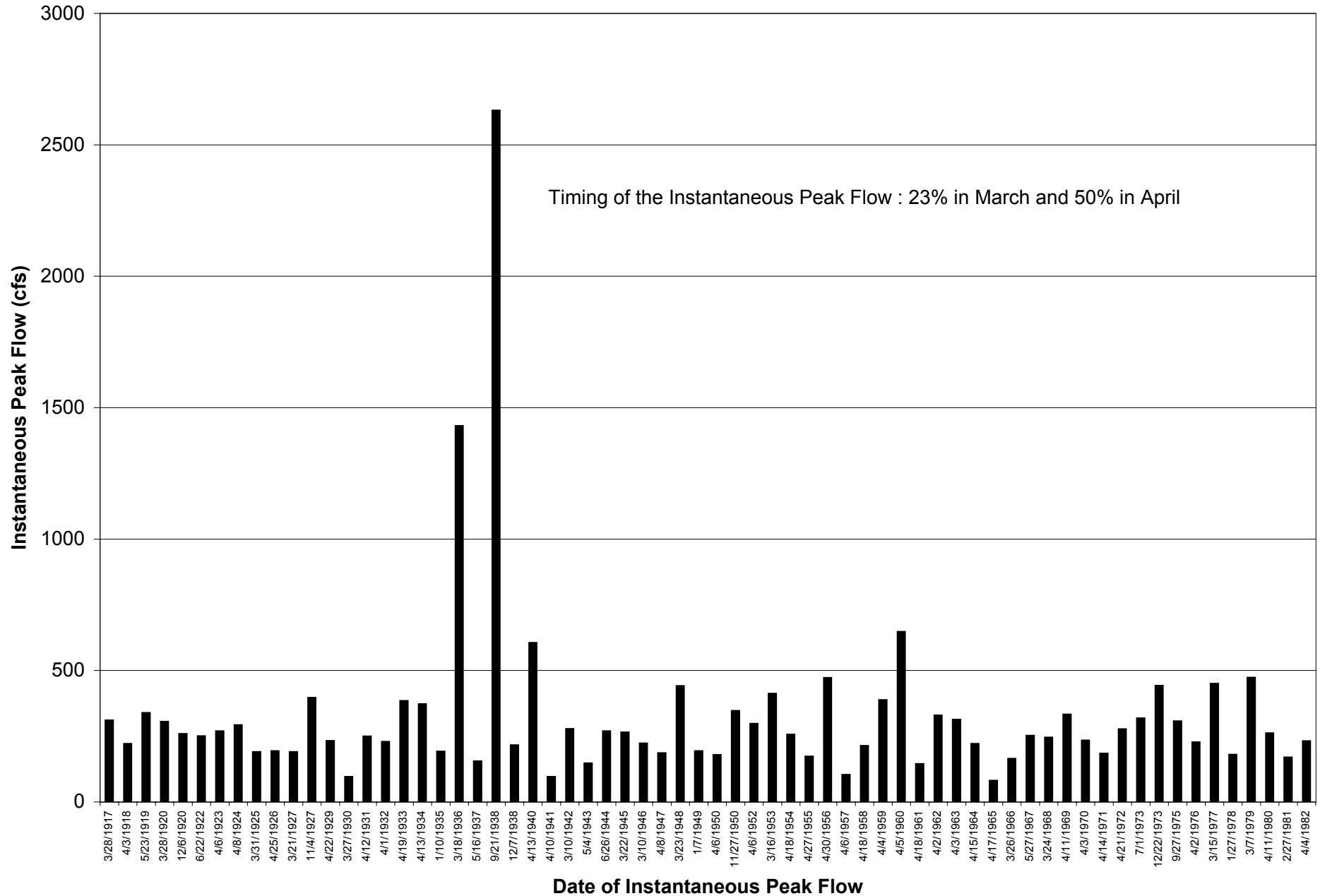
**FIGURE 8.4.1-8**

**Millers River at Erving, MA, Annual 7 Day Consecutive Low Flow,  
Drainage Area= 372 square miles**



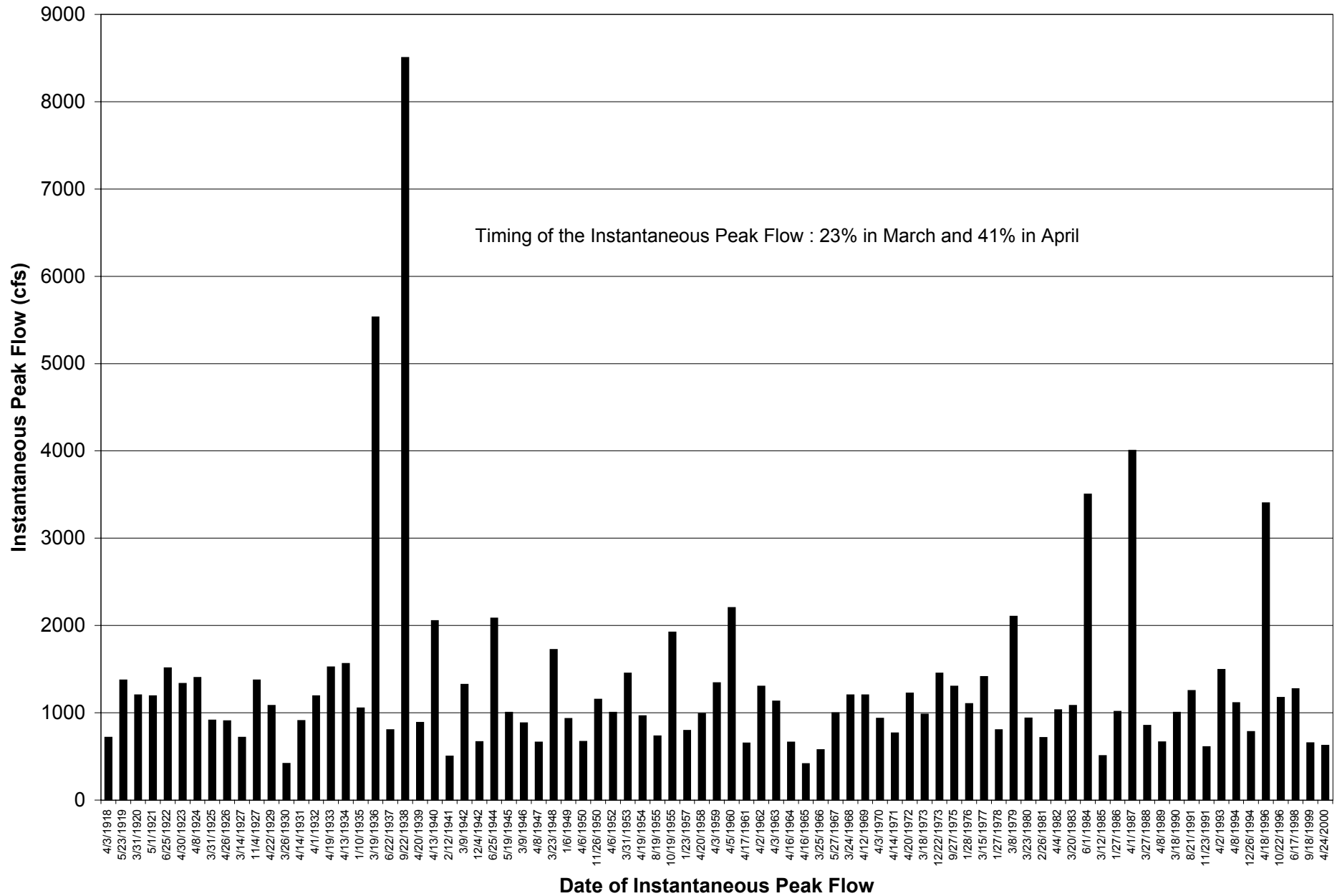
**FIGURE 8.4.1-9**

**Tarbell Brook near Winchendon, MA, Instantaneous Peak Flows,  
Drainage Area= 17.8 square miles**



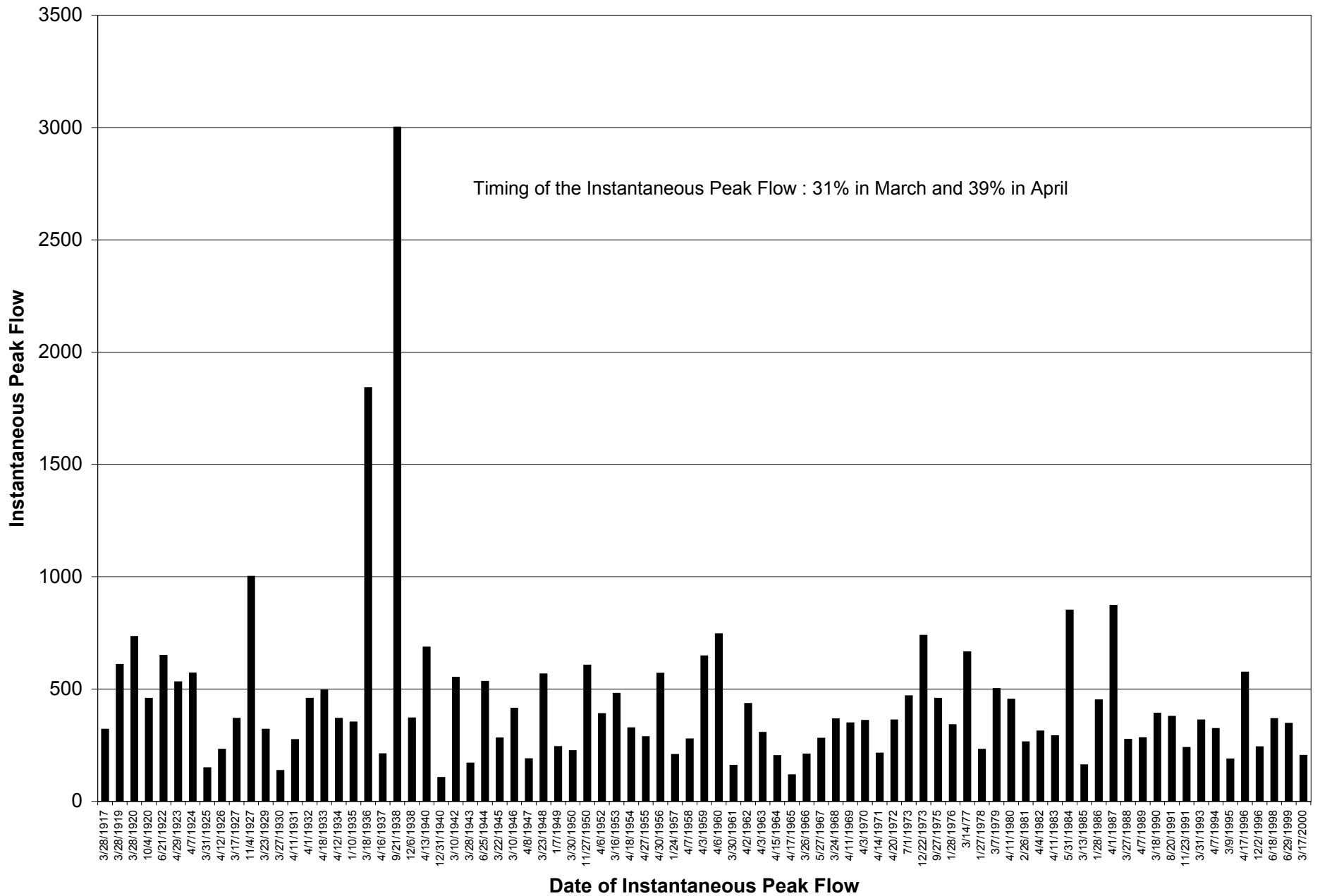
**FIGURE 8.4.2-1**

**Millers River near Winchendon, MA, Instantaneous Peak Flows,  
Drainage Area= 81.8 square miles**



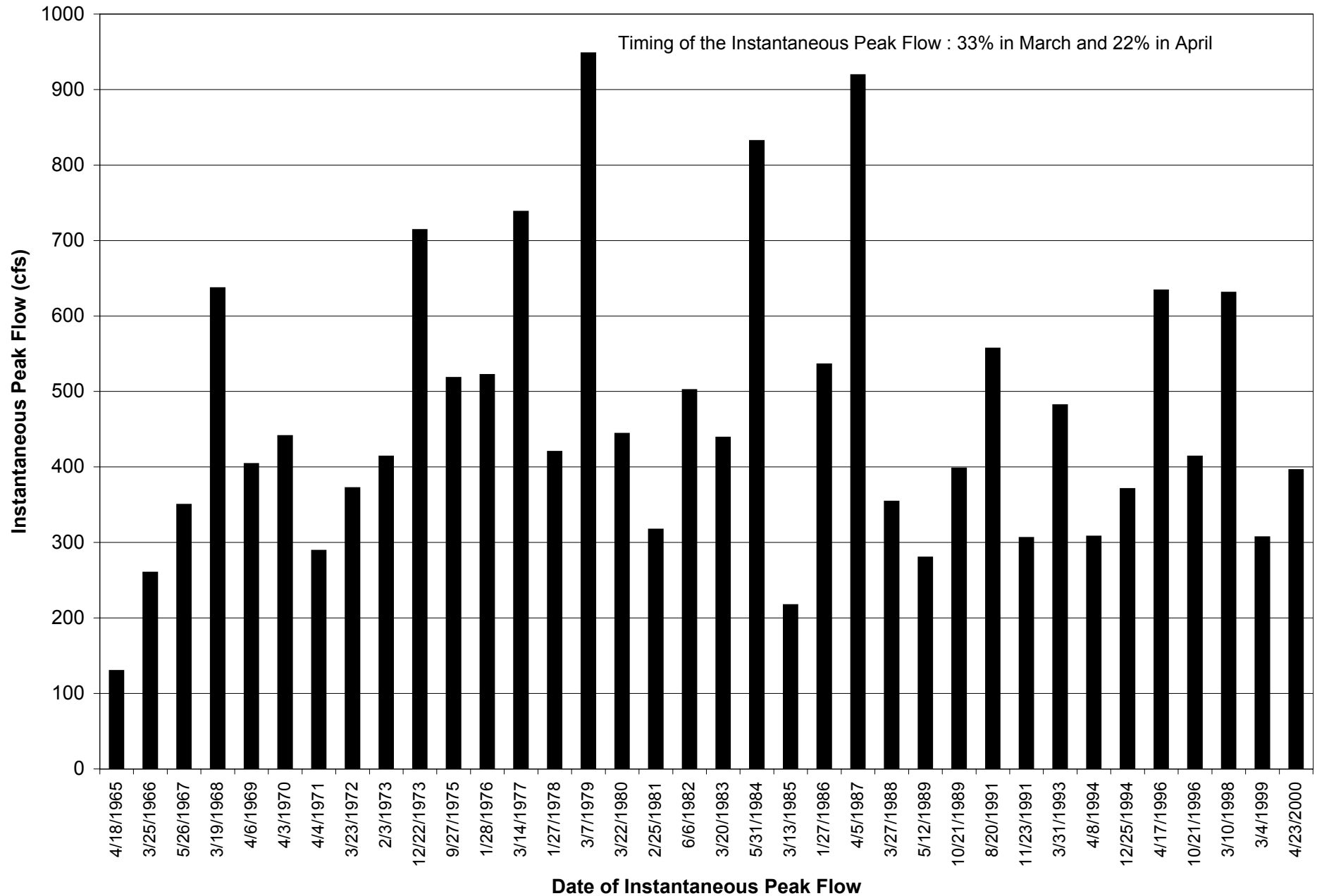
**FIGURE 8.4.2-2**

**Priest Brook near Winchendon, MA, Instantaneous Peak Flows,  
Drainage Area= 19.4 square miles**



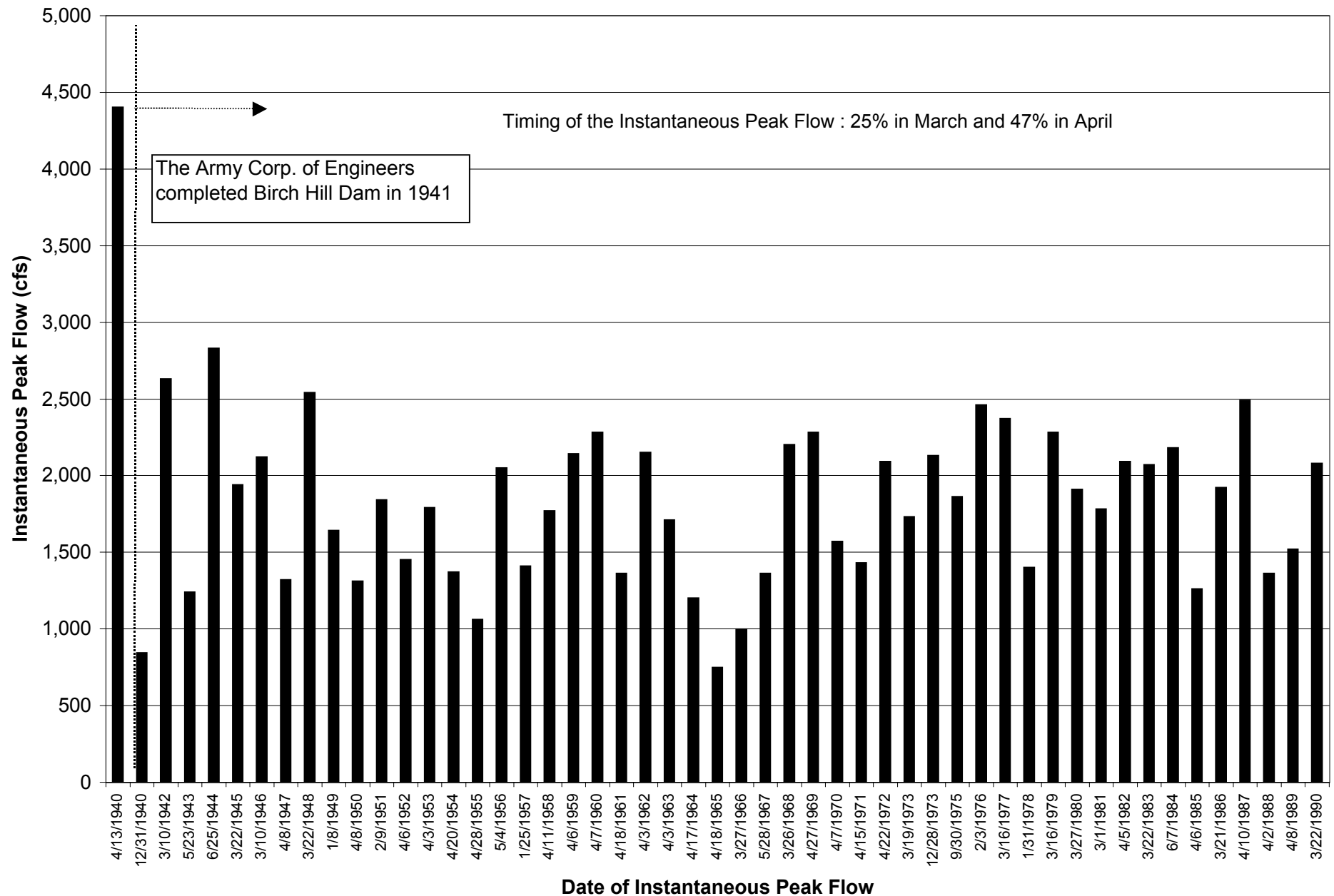
**FIGURE 8.4.2-3**

**Otter River at Otter River, MA, Instantaneous Peak Flows,  
Drainage Area= 34.1 square miles**



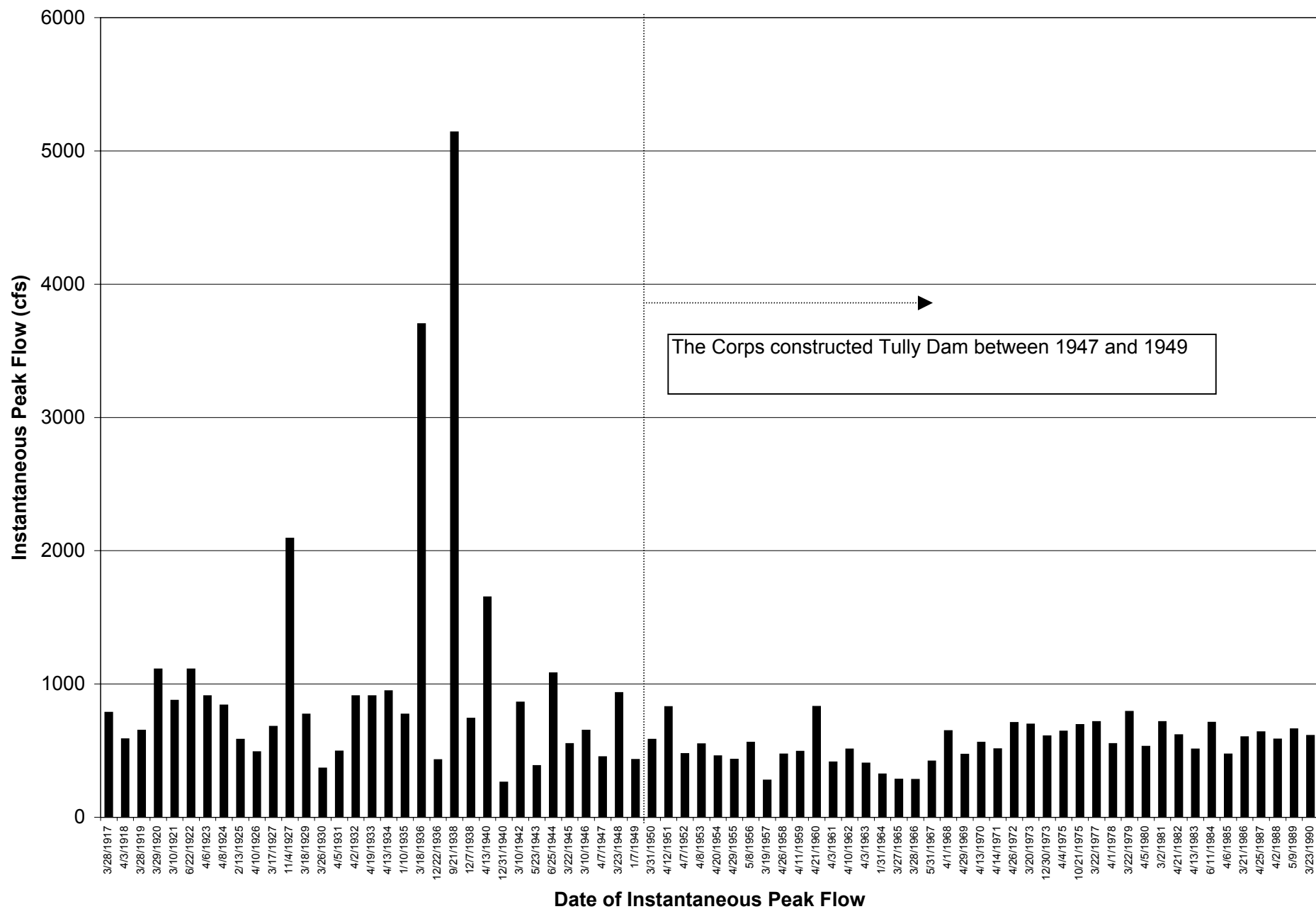
**FIGURE 8.4.2-4**

**Millers River at South Royalston, MA, Instantaneous Peak Flows,  
Drainage Area= 189 square miles**



**FIGURE 8.4.2-5**

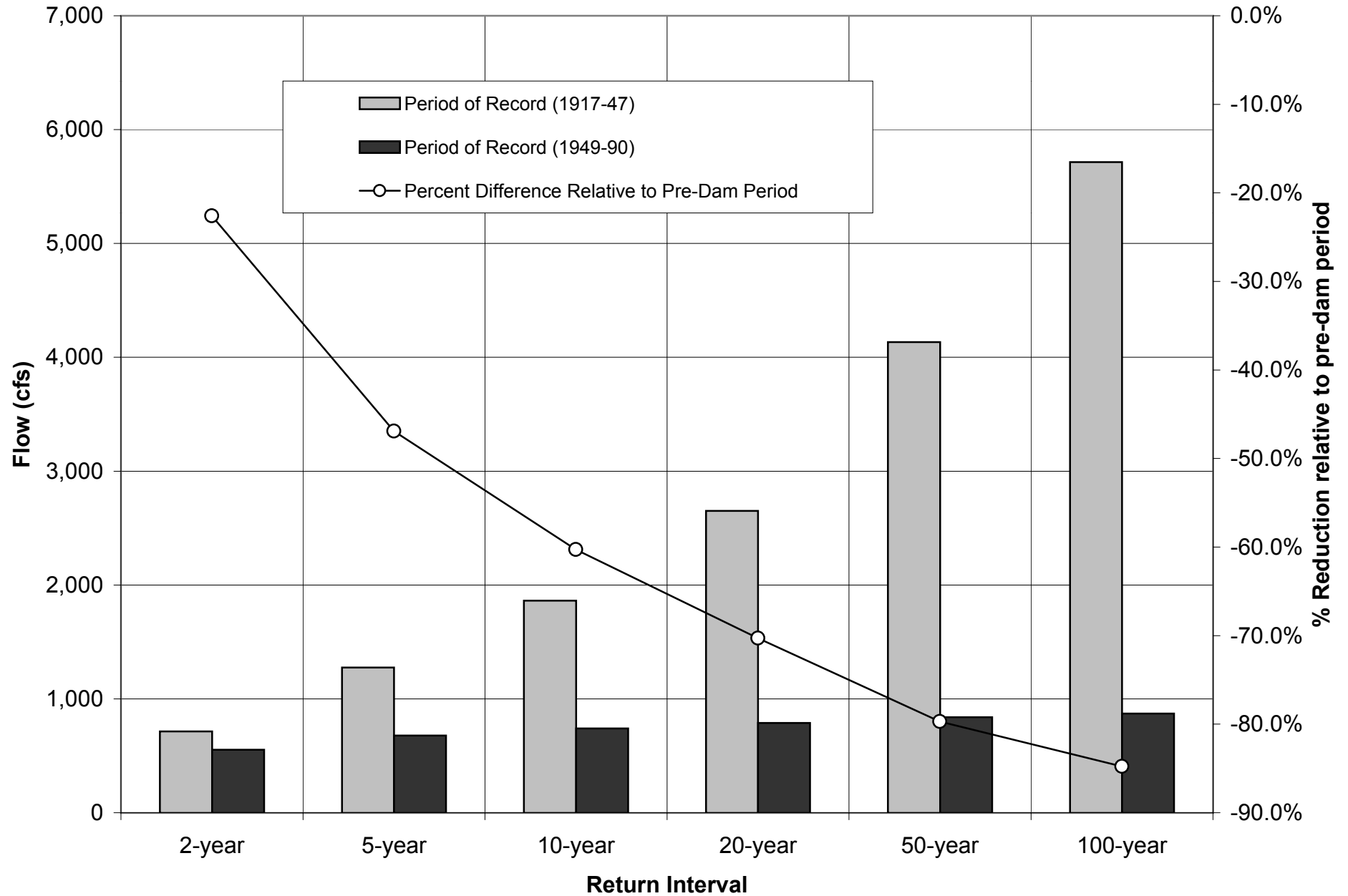
**East Branch Tully River near Athol, MA, Instantaneous Peak Flows,  
Drainage Area= 50.5 square miles**



**FIGURE 8.4.2-6**

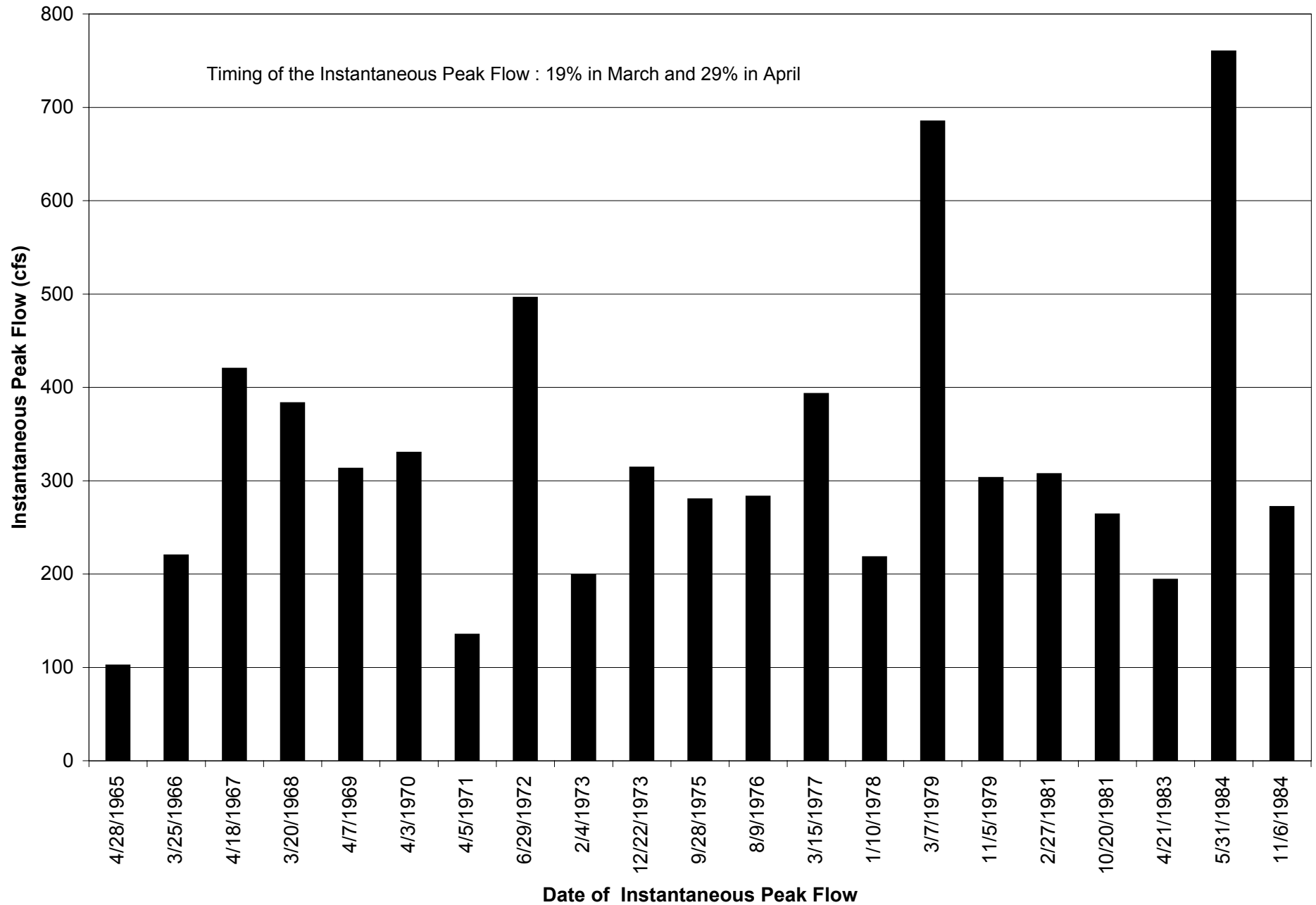


**East Branch of the Tully River, Flood Frequency Results for the 2-, 5-, 10-, 20-, 50- and 100-Year Return Intervals (Pre and Post Tully Lake Dam Construction)**



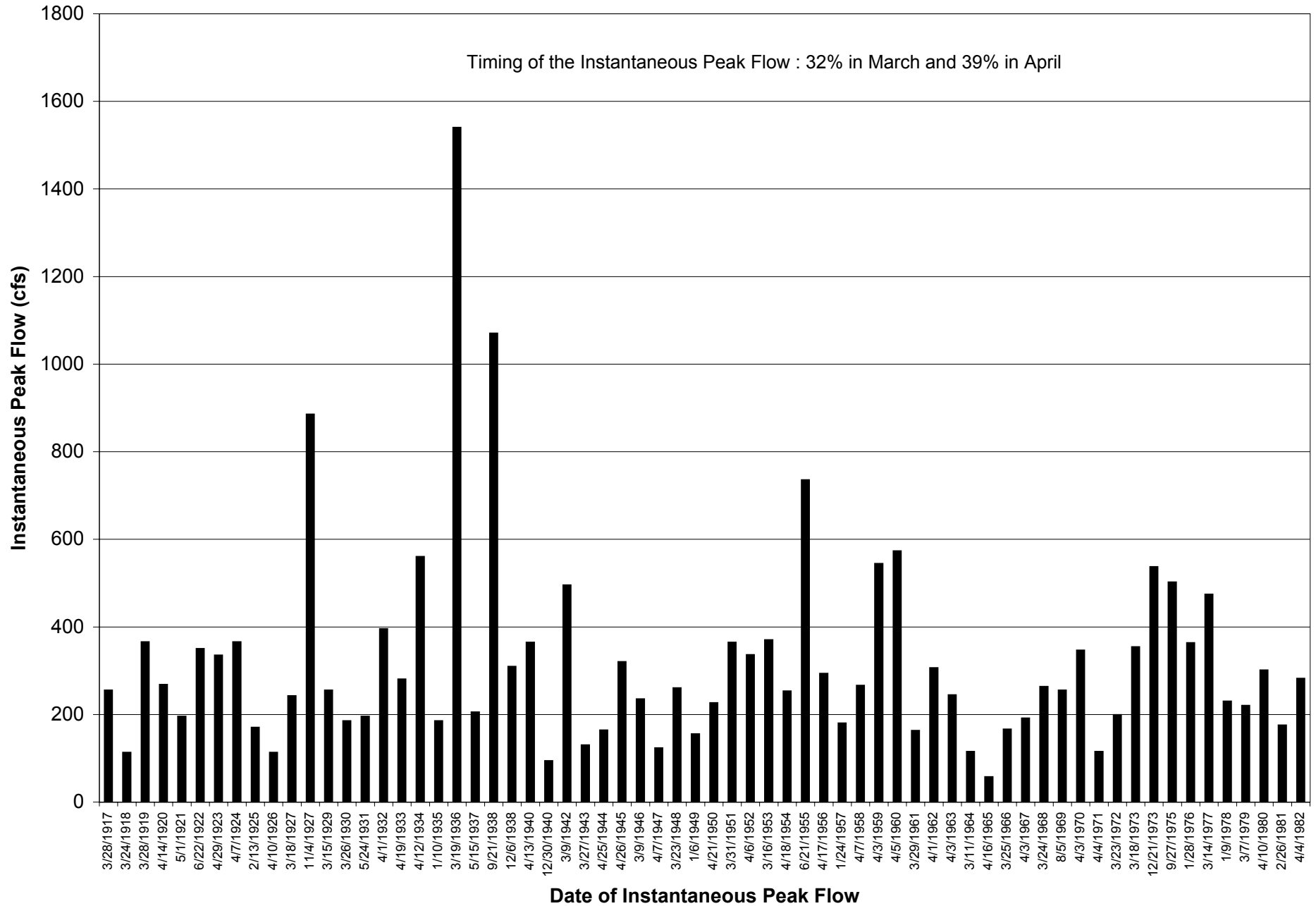
**FIGURE 8.4.2-7**

**Lake Rohunta Outlet near Athol, MA, Instantaneous Peak Flows,  
Drainage Area= 20.3 square miles**



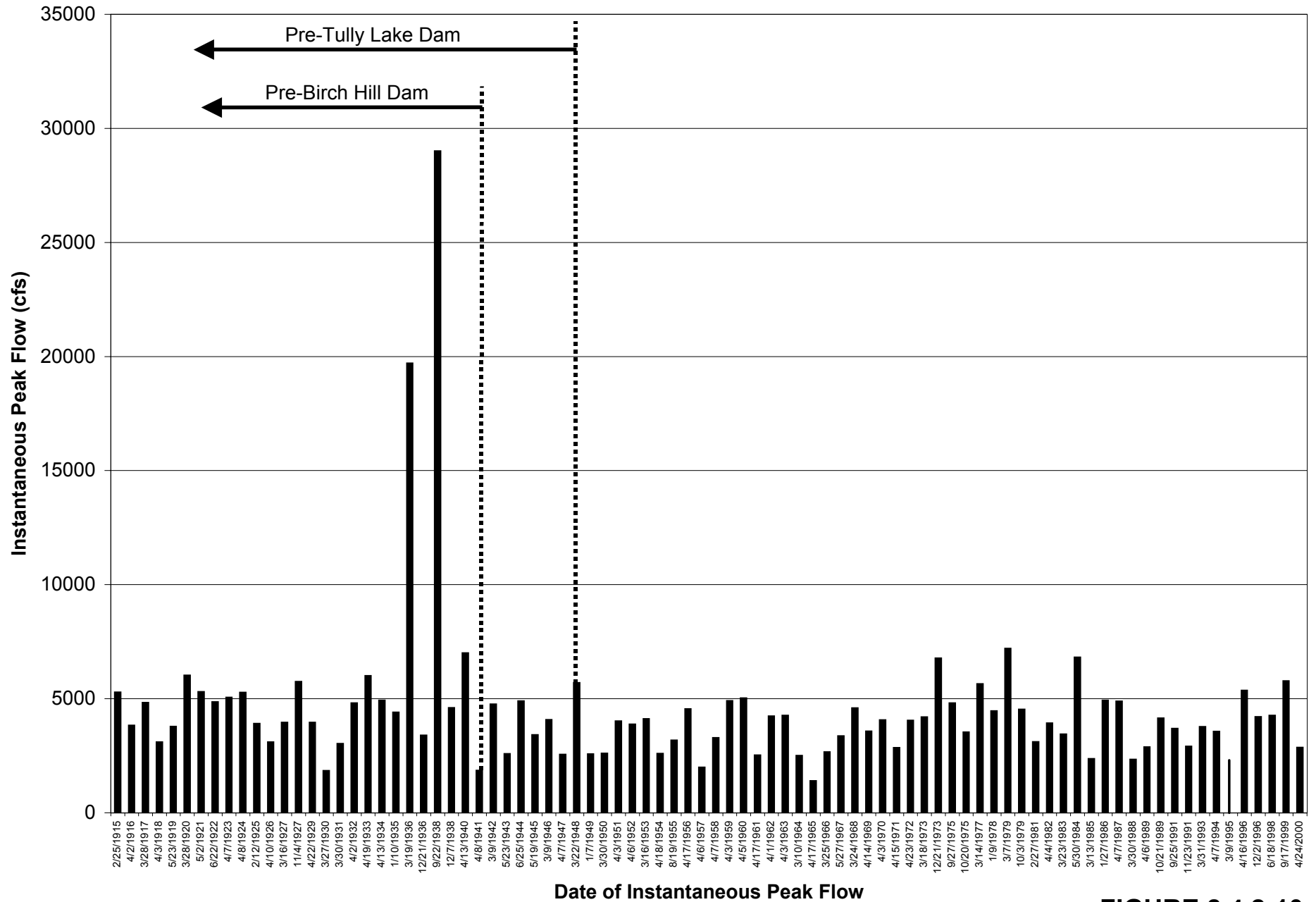
**FIGURE 8.4.2-8**

**Moss Brook at Wendell Depot, MA, Instantaneous Peak Flows,  
Drainage Area= 12.1 square miles**



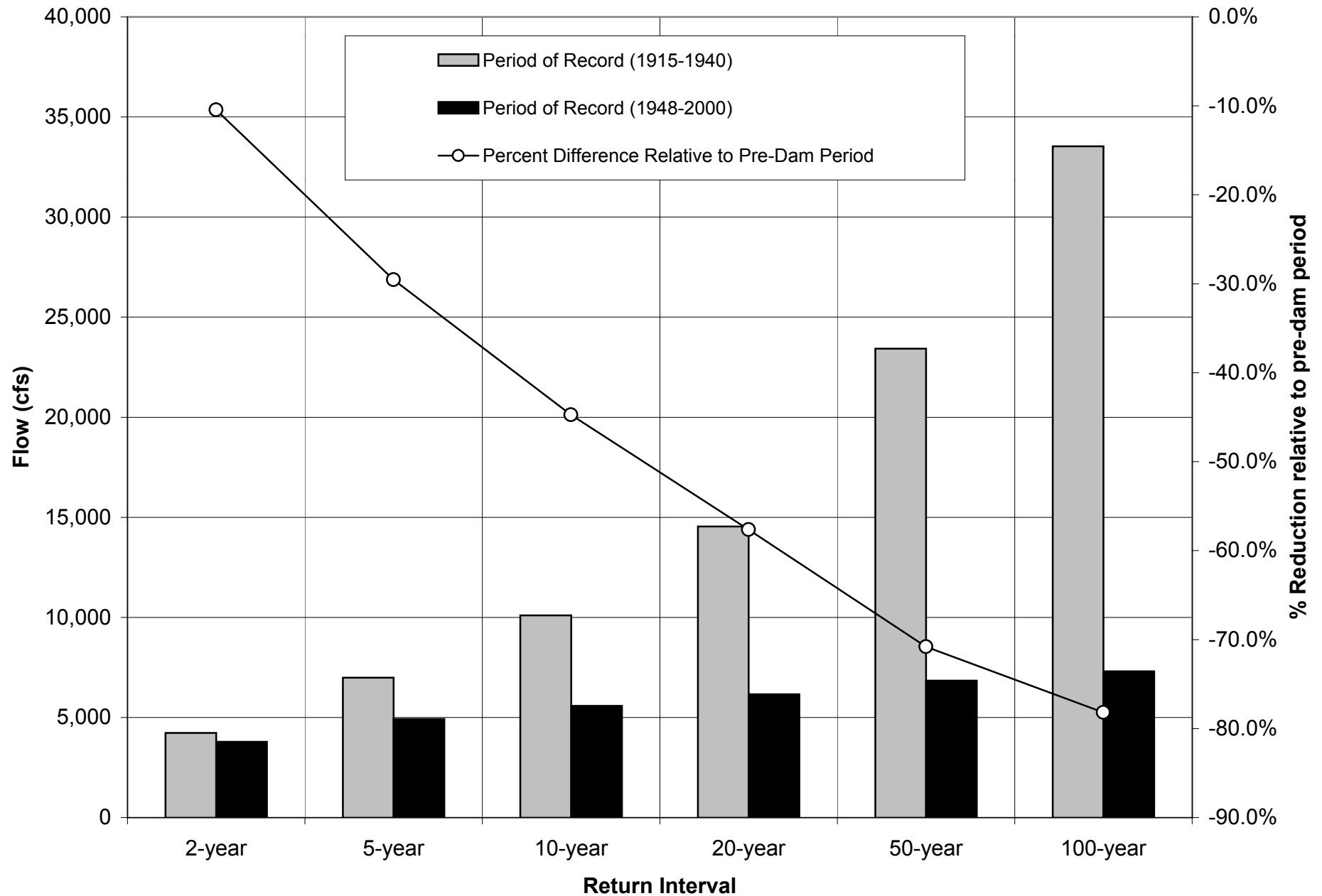
**FIGURE 8.4.2-9**

**Millers River at Erving, MA, Instantaneous Peak Flows,  
Drainage Area= 372 square miles**



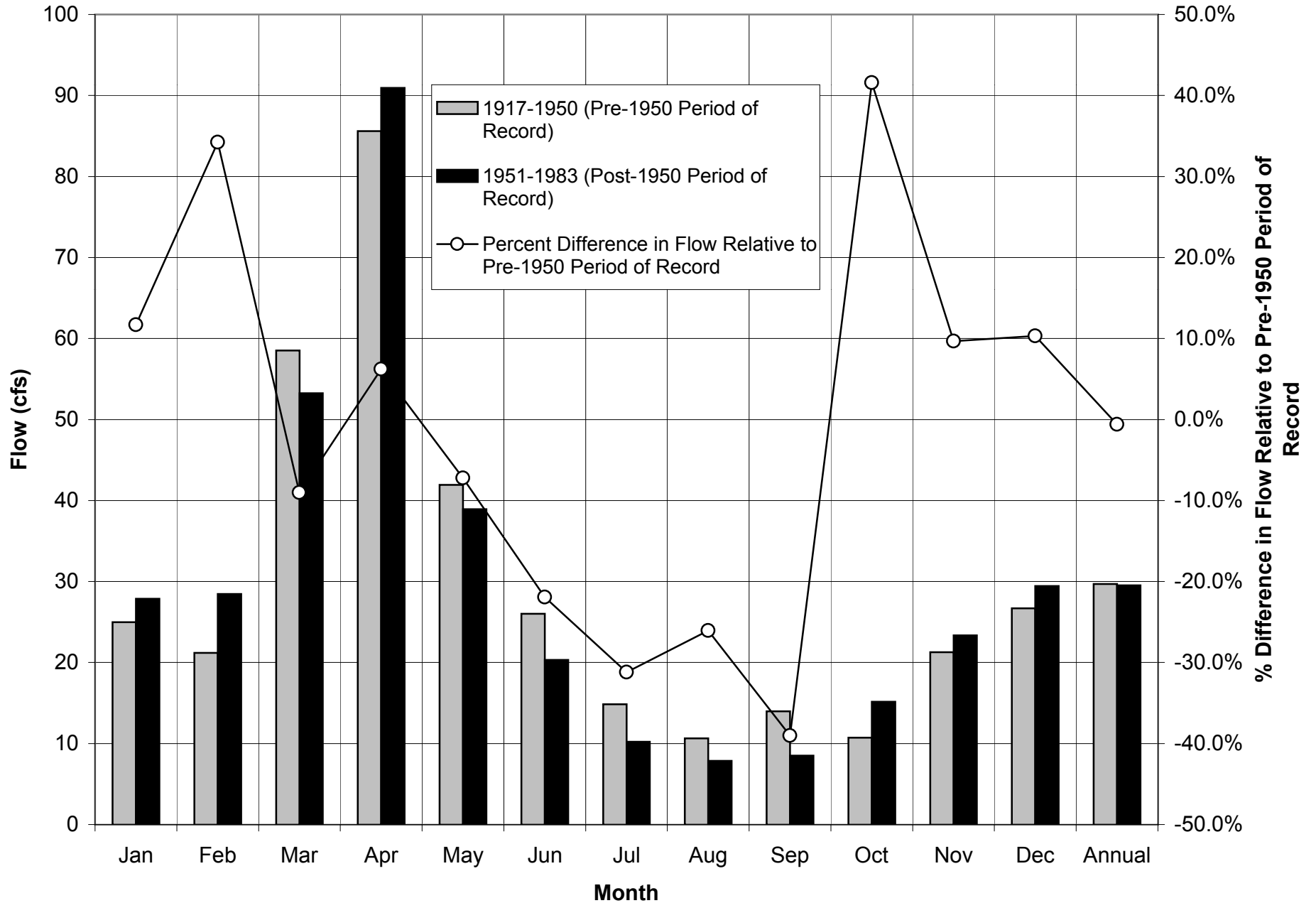
**FIGURE 8.4.2-10**

**Millers River at Erving, MA, Flood Frequency Results for the 2-, 5-, 10-, 20-, 50-, and 100-Year Return Intervals (Pre and Post Tully Dam and Birch Hill Dam Construction)**



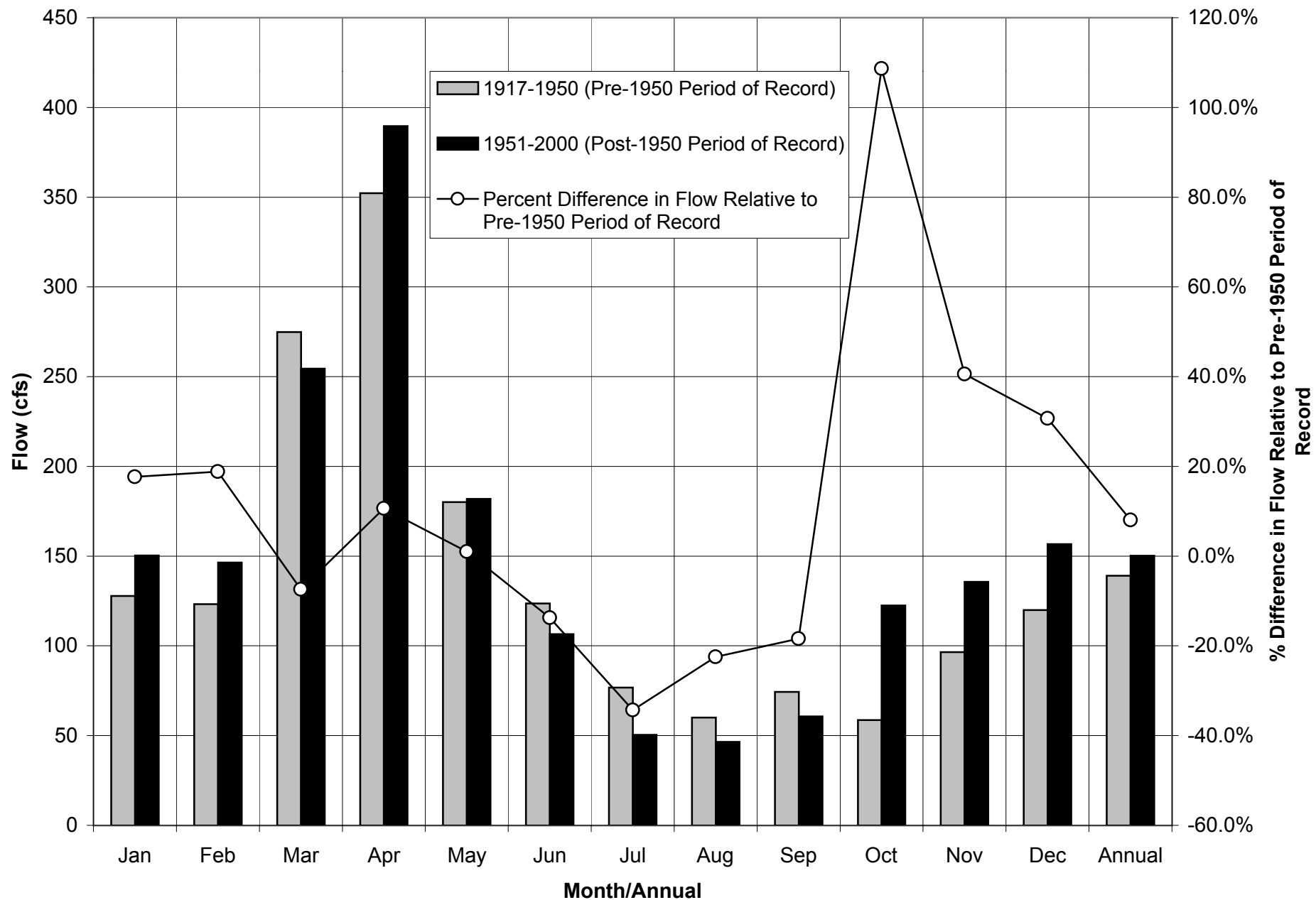
**FIGURE 8.4.2-11**

**Tarbell Brook near Winchendon, MA, Comparison of Mean Monthly and Mean Annual Flows, Pre and Post 1950**



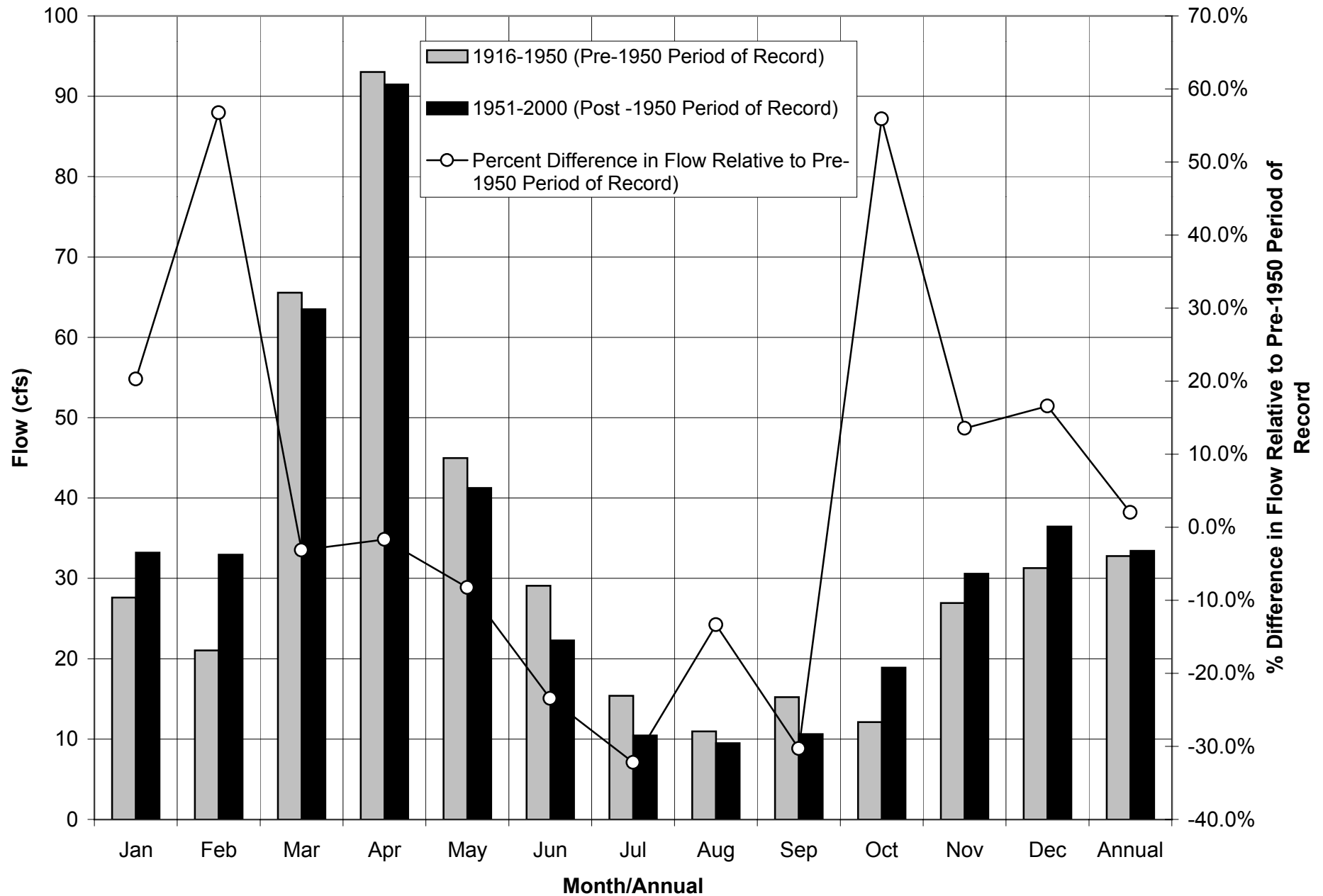
**FIGURE 8.4.3-1**

**Millers River near Winchendon, MA, Comparison of Mean Monthly and Mean Annual Flows, Pre and Post 1950 Period of Record**



**FIGURE 8.4.3-2**

**Priest Brook near Winchendon, MA, Comparison of Mean Monthly and Mean Annual Flows, Pre and Post 1950**



**FIGURE 8.4.3-3**



Otter River at Otter River, MA, Mean Monthly and Mean Annual Flows

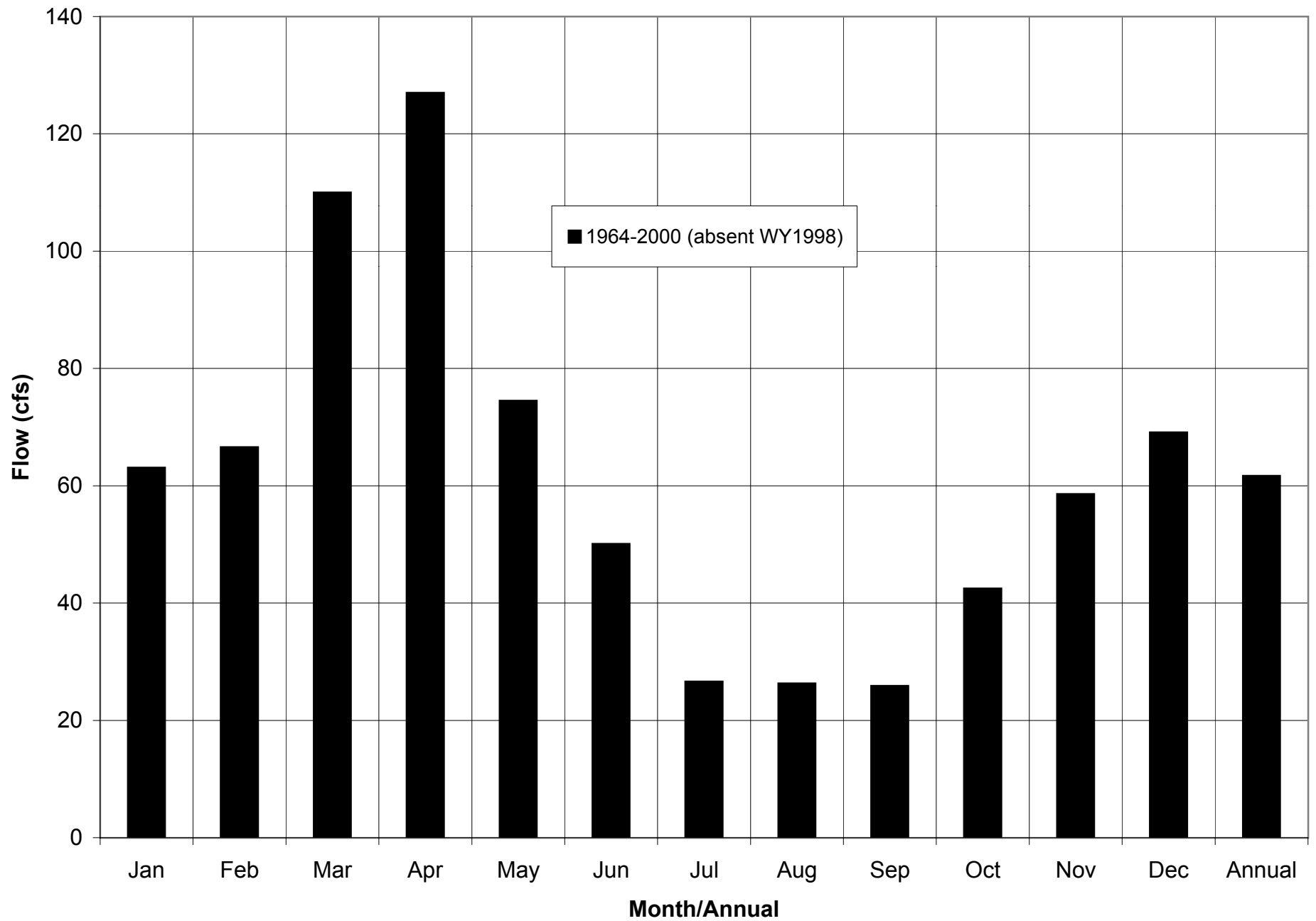
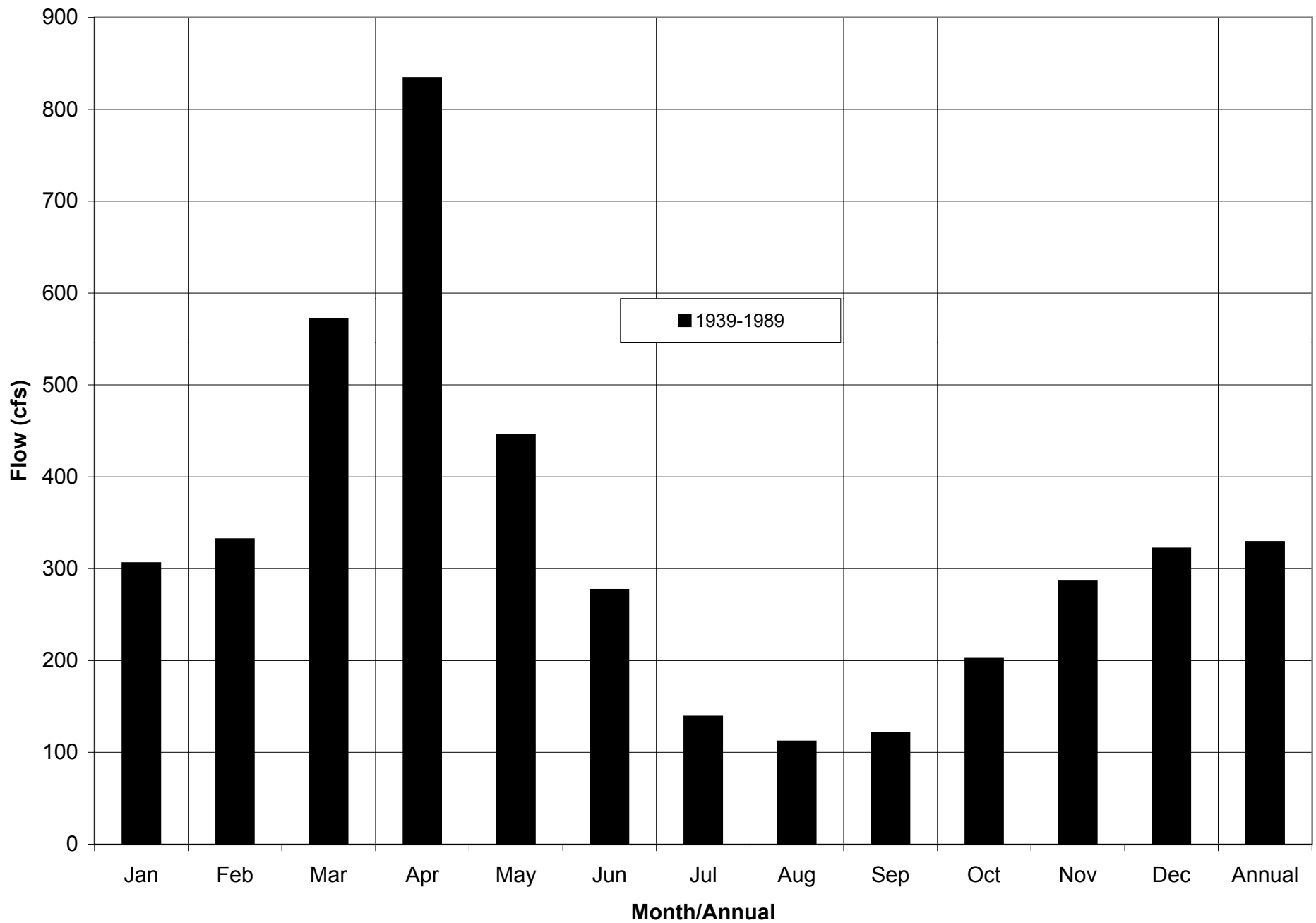


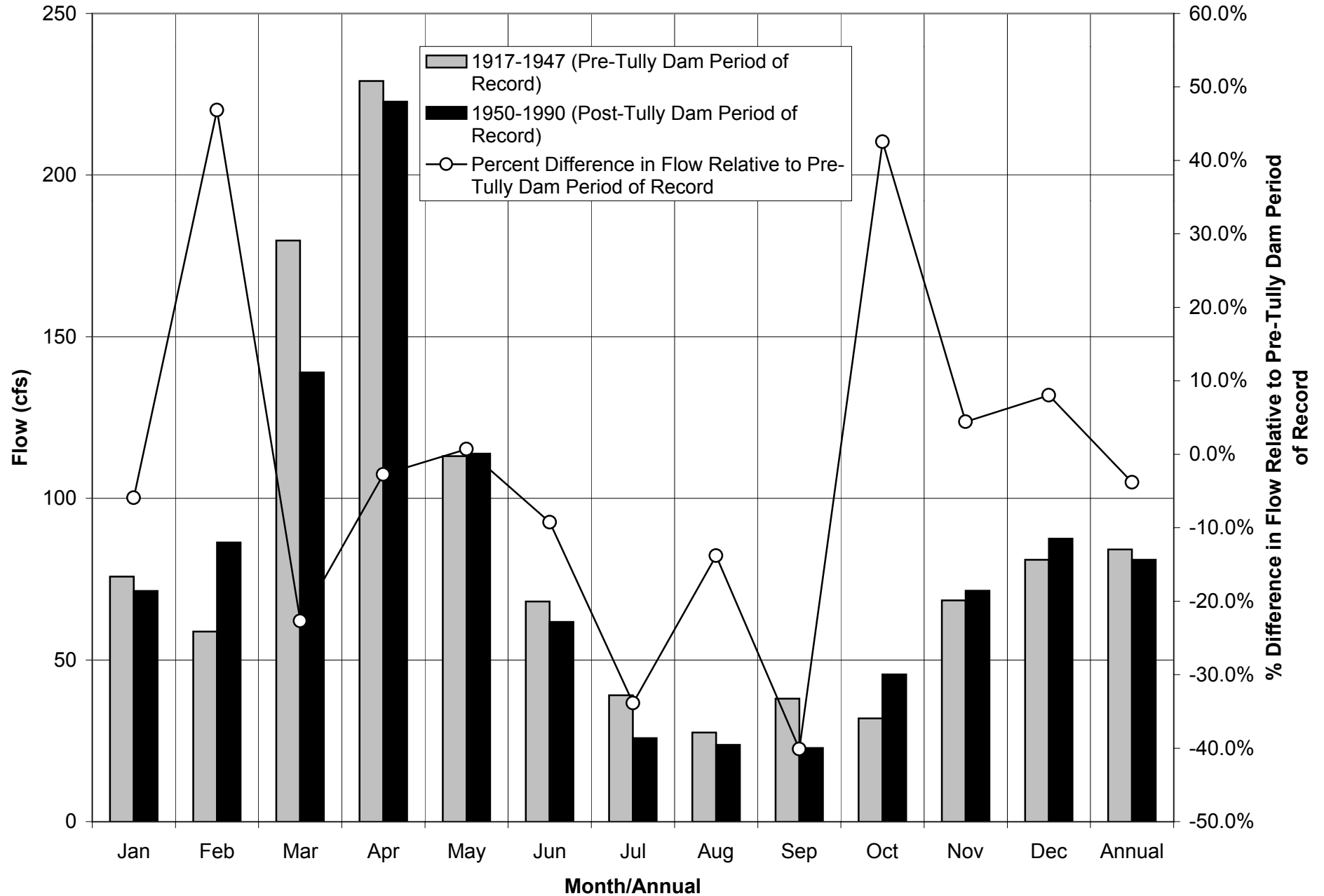
FIGURE 8.4.3-4

**Millers River at South Royalston, MA, Mean Monthly and Mean Annual Flows**



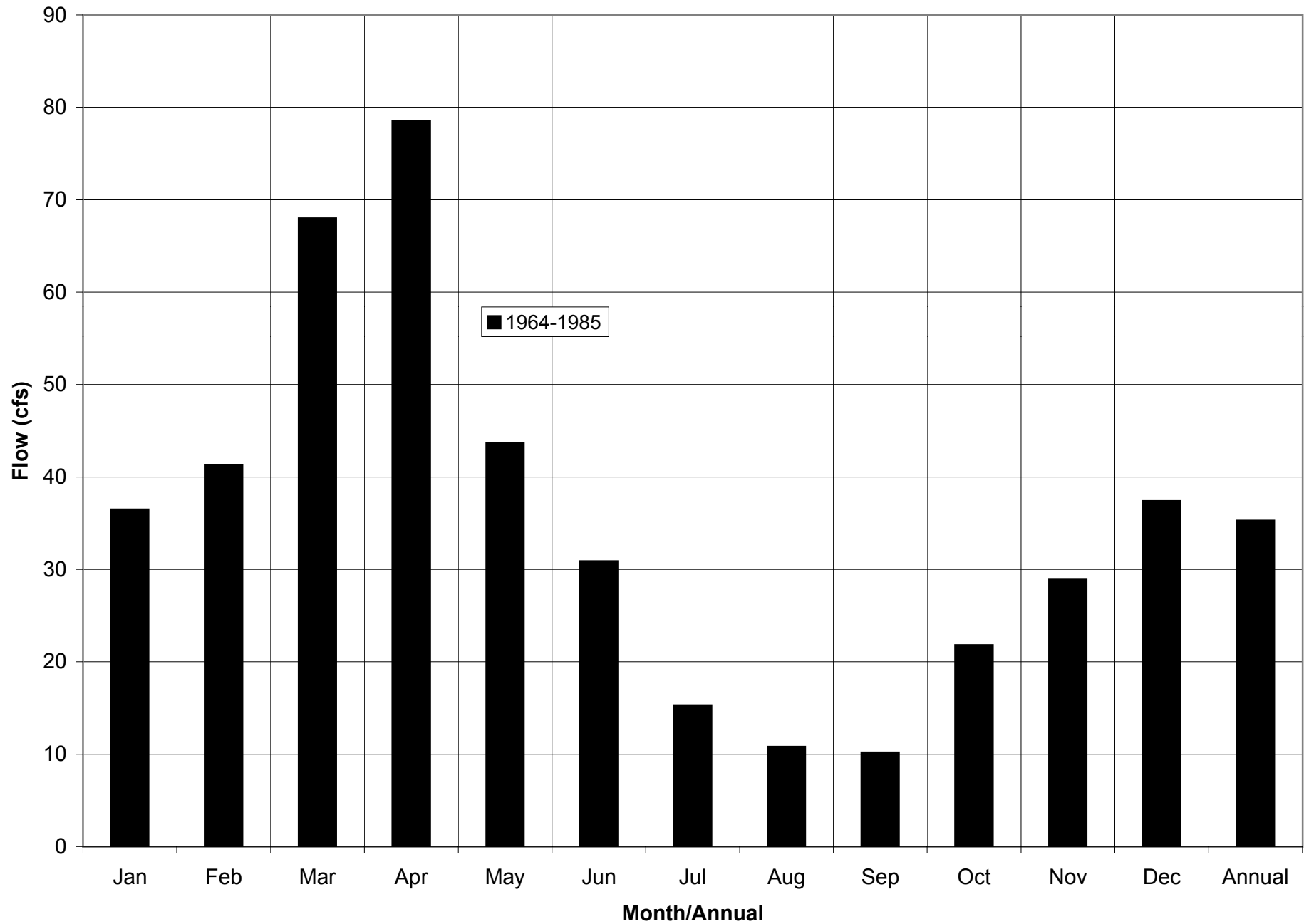
**FIGURE 8.4.3-5**

**East Branch Tully River, Comparison of Mean Monthly and Mean Annual Flows, Pre and Post Tully Lake Dam Construction**



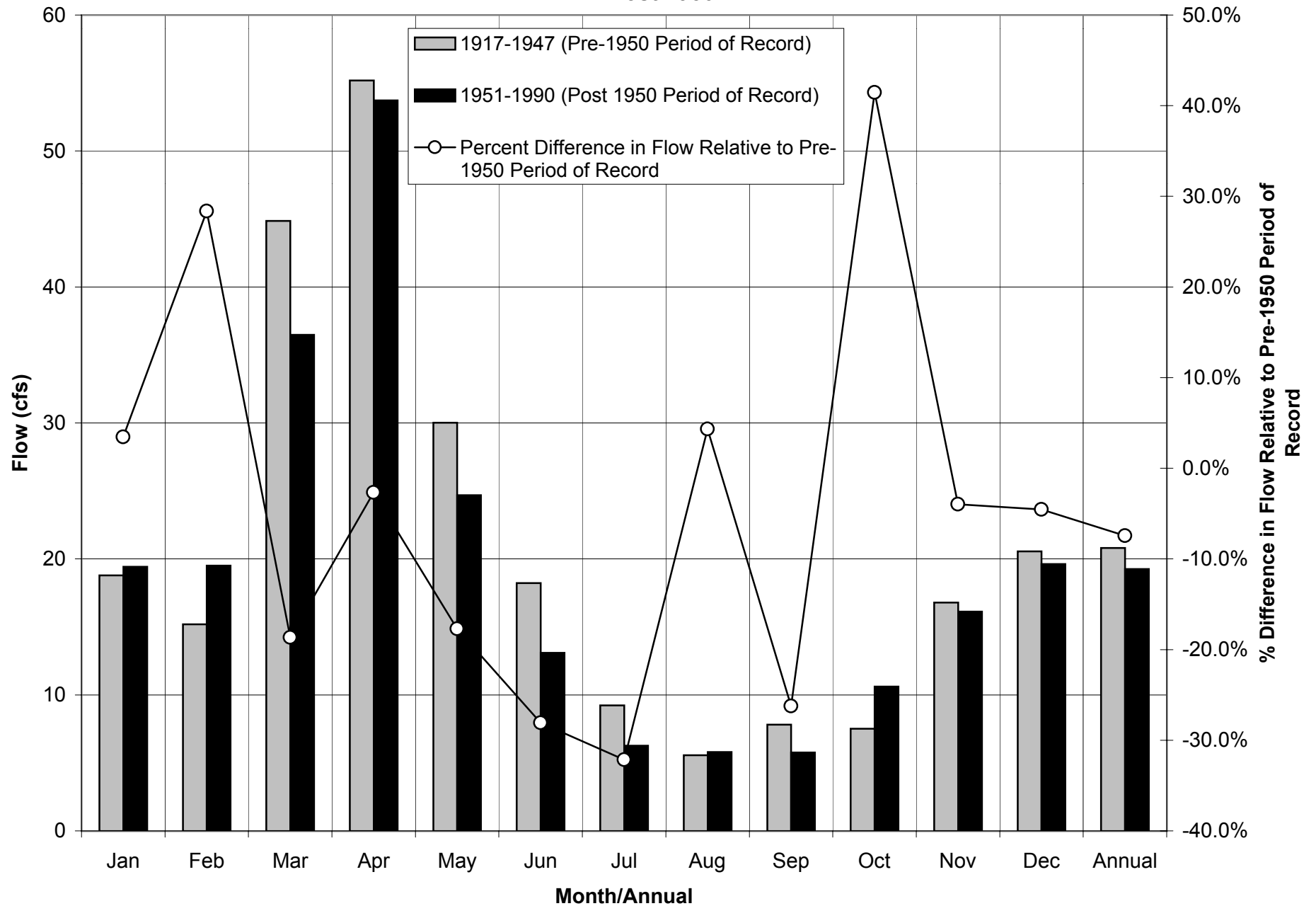
**FIGURE 8.4.3-6**

**Lake Rohunta Outlet near Athol, MA, Mean Monthly and Mean Annual Flows**



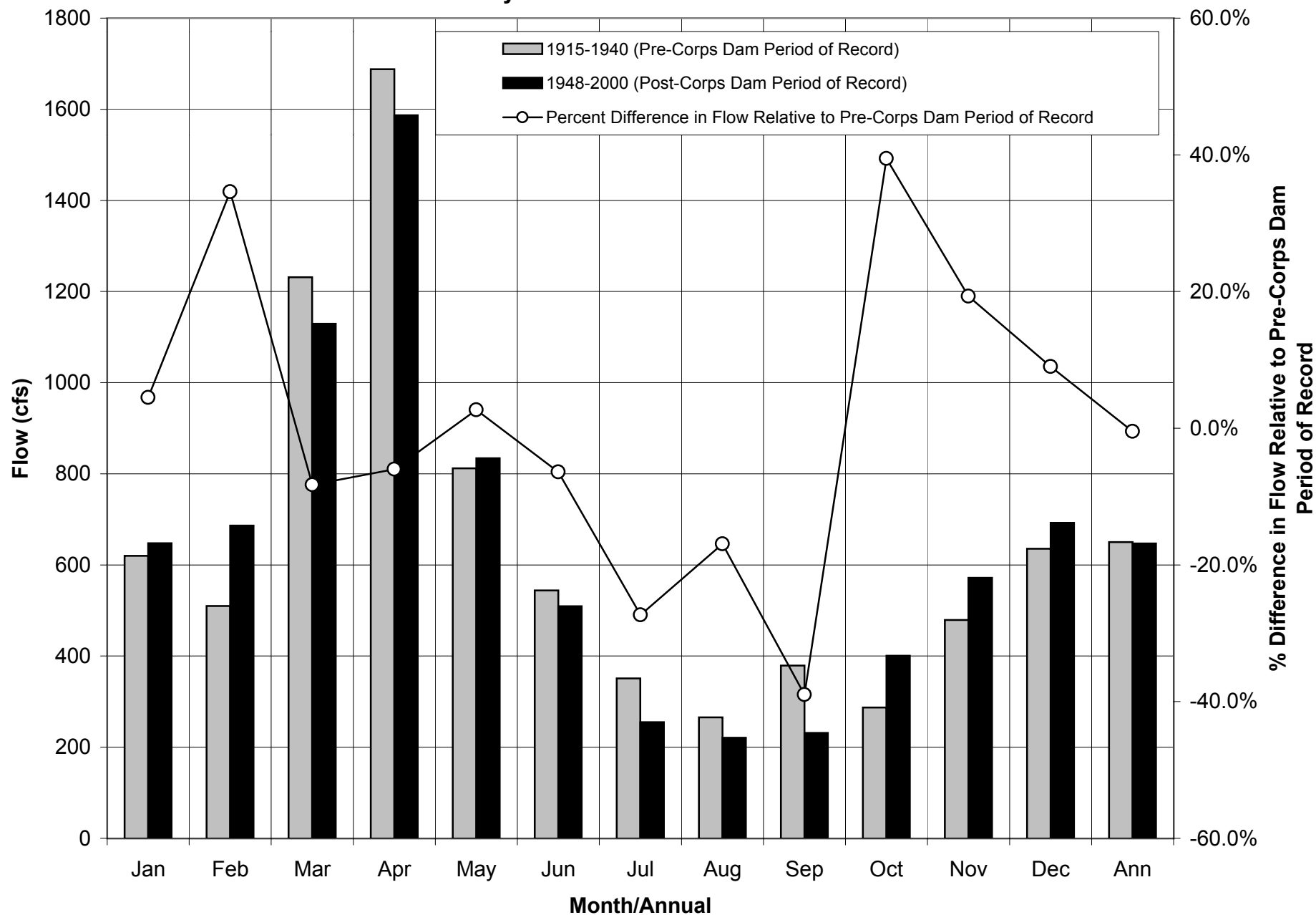
**FIGURE 8.4.3-7**

**Moss Brook at Wendell Depot, MA, Comparison of Mean Monthly and Mean Annual Flows, Pre and Post 1950**



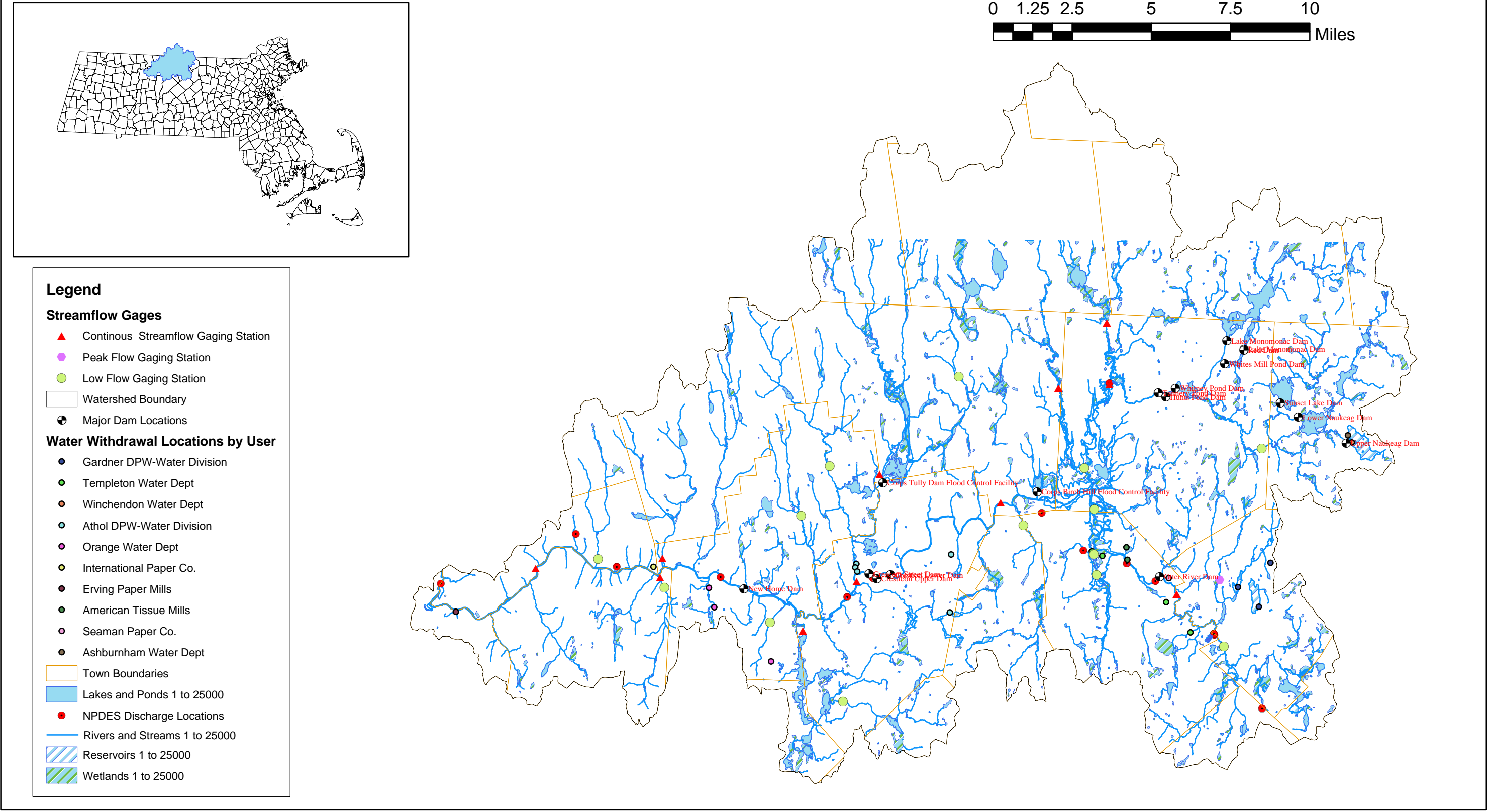
**FIGURE 8.4.3-8**

**Millers River at Erving, MA, Comparison of Mean Monthly and Mean Annual Flows, Pre and Post Tully and Birch Hill Lake Construction**



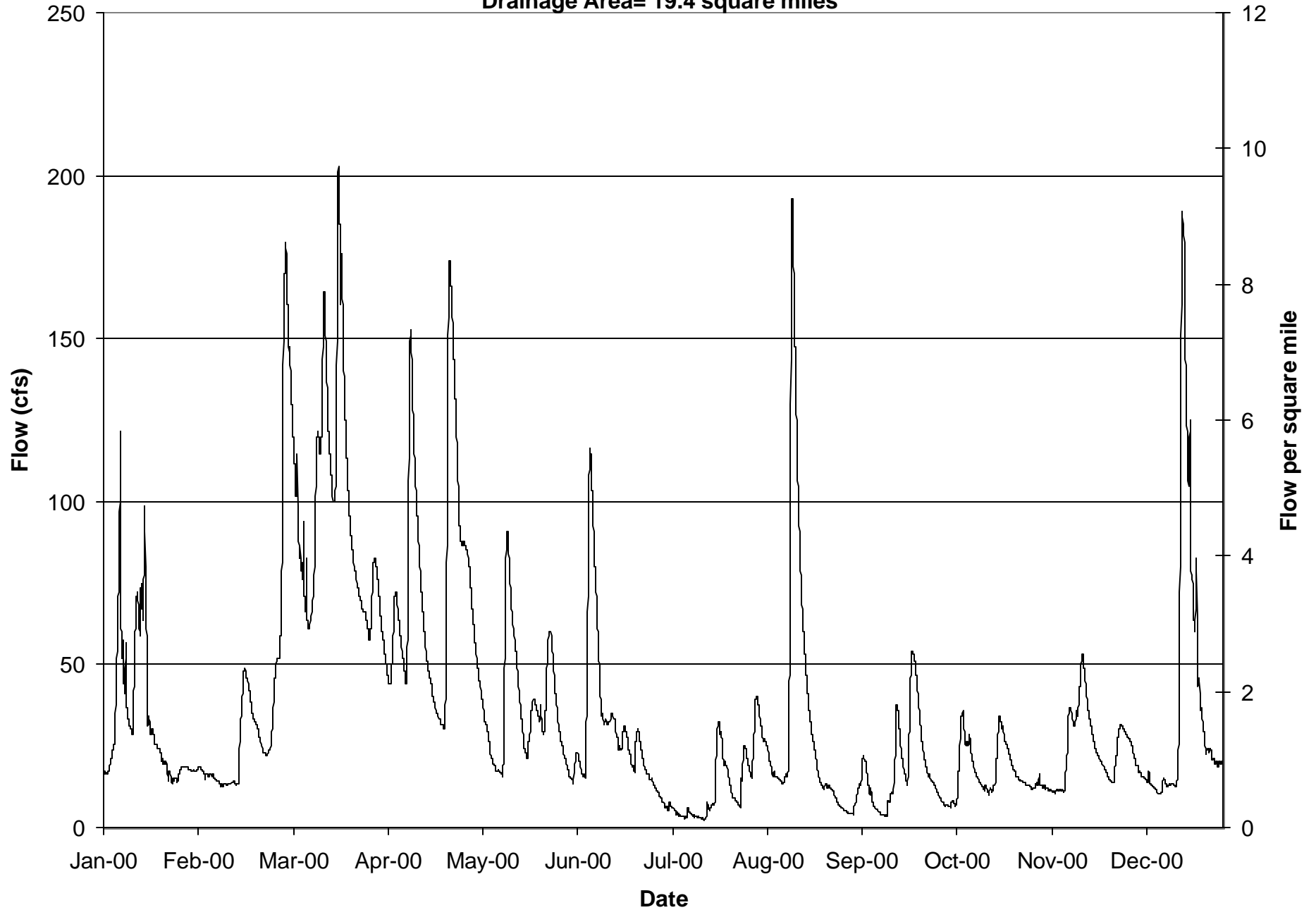
**FIGURE 8.4.3-9**

Figure 8.4.4-1: Location of USGS/Corps Flow Gages, Major Dams, Withdrawals>100,000 gpd and NPDES Dischargers in the Millers River Basin



**Priest Brook near Winchendon, MA, Hourly Hydrograph for Calendar Year 2000**

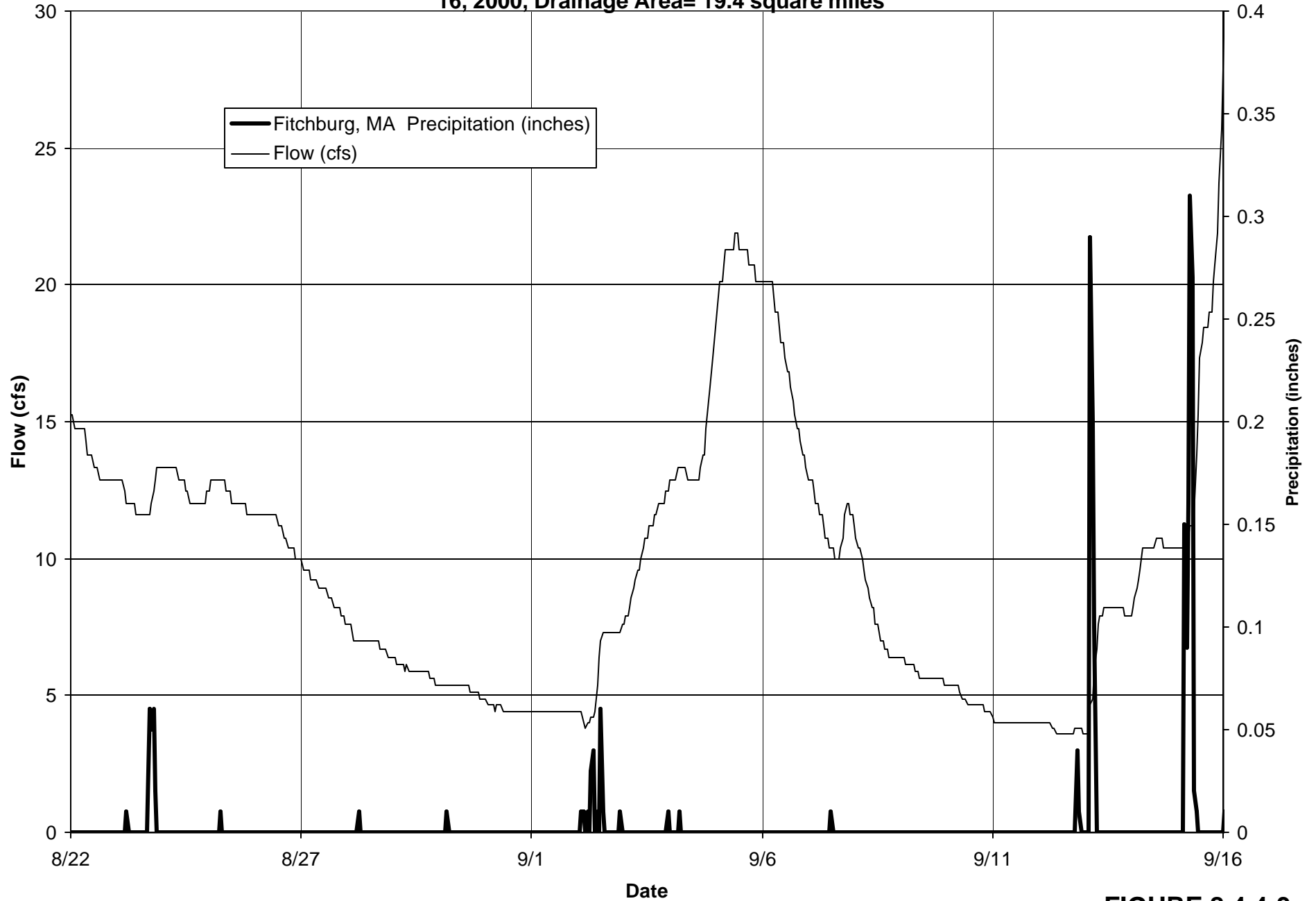
**Drainage Area= 19.4 square miles**



**FIGURE 8.4.4-2**



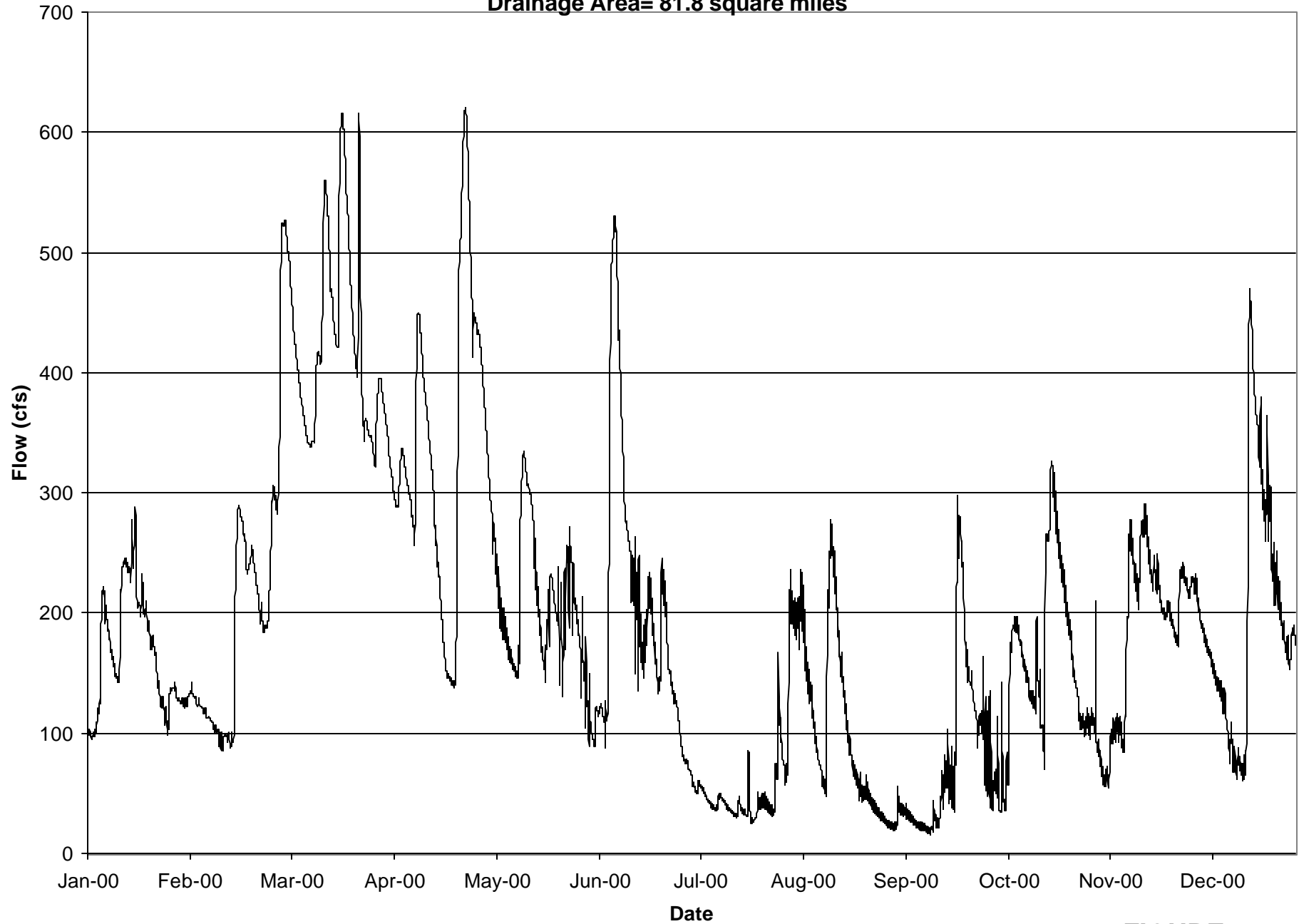
**Priest Brook near Winchendon, MA, Hourly Hydrograph and Precipitation for August 22-September 16, 2000, Drainage Area= 19.4 square miles**



**FIGURE 8.4.4-3**

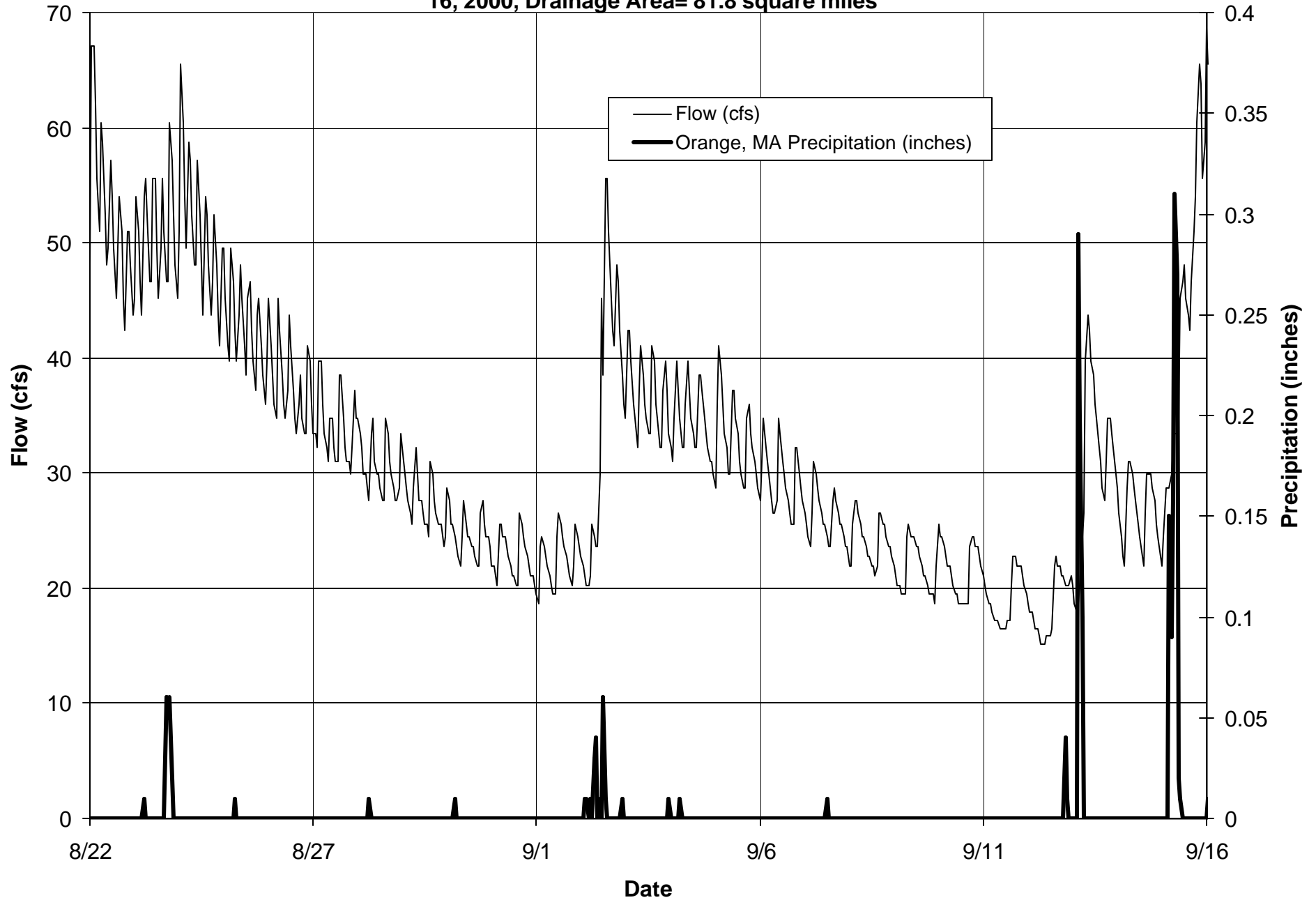
**Millers River near Winchendon, MA, Hourly Hydrograph for Calendar Year 2000**

**Drainage Area= 81.8 square miles**



**FIGURE 8.4.4-4**

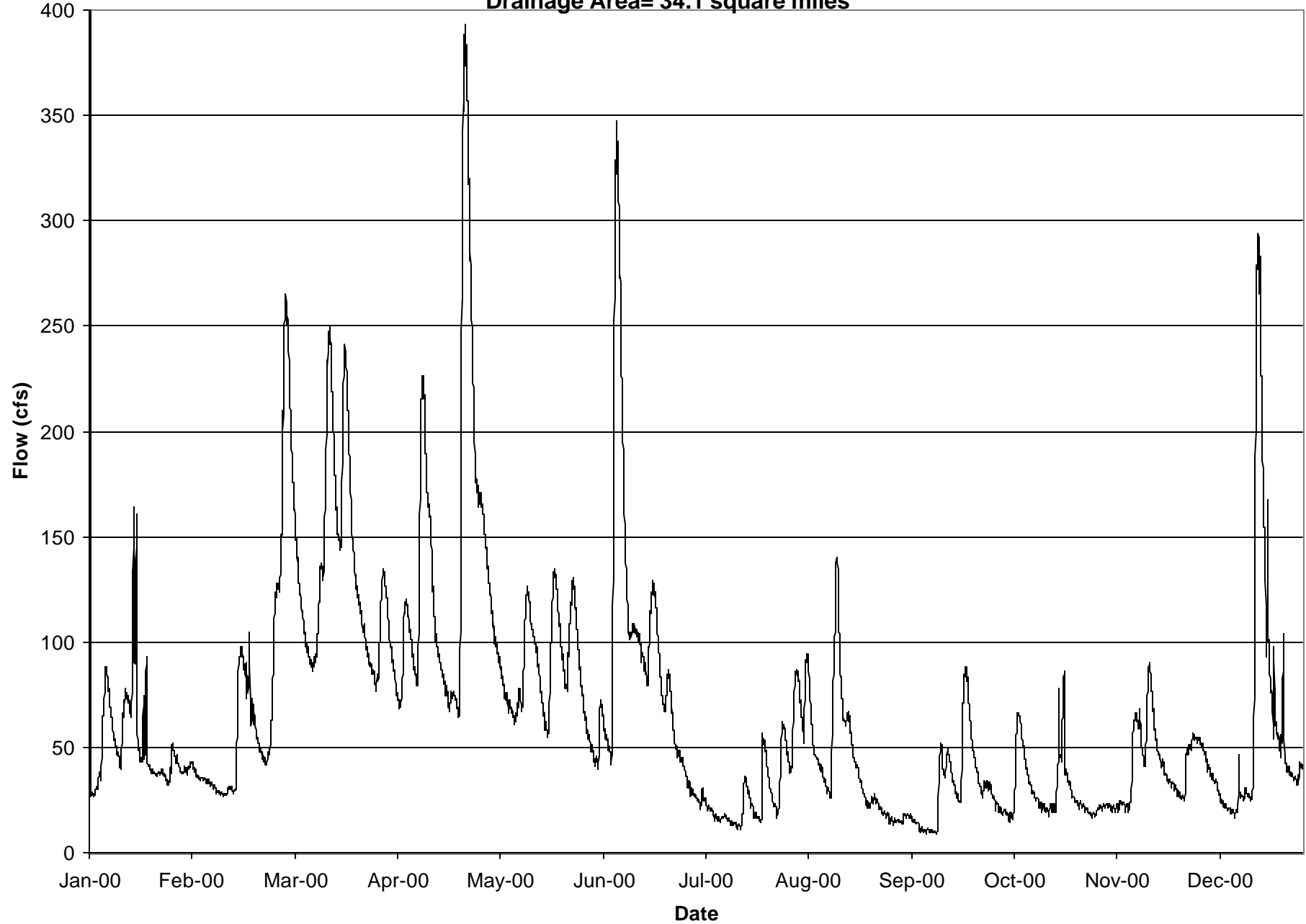
**Millers River near Winchendon, MA, Hourly Hydrograph and Precipitation for August 22-September 16, 2000, Drainage Area= 81.8 square miles**



**FIGURE 8.4.4-5**

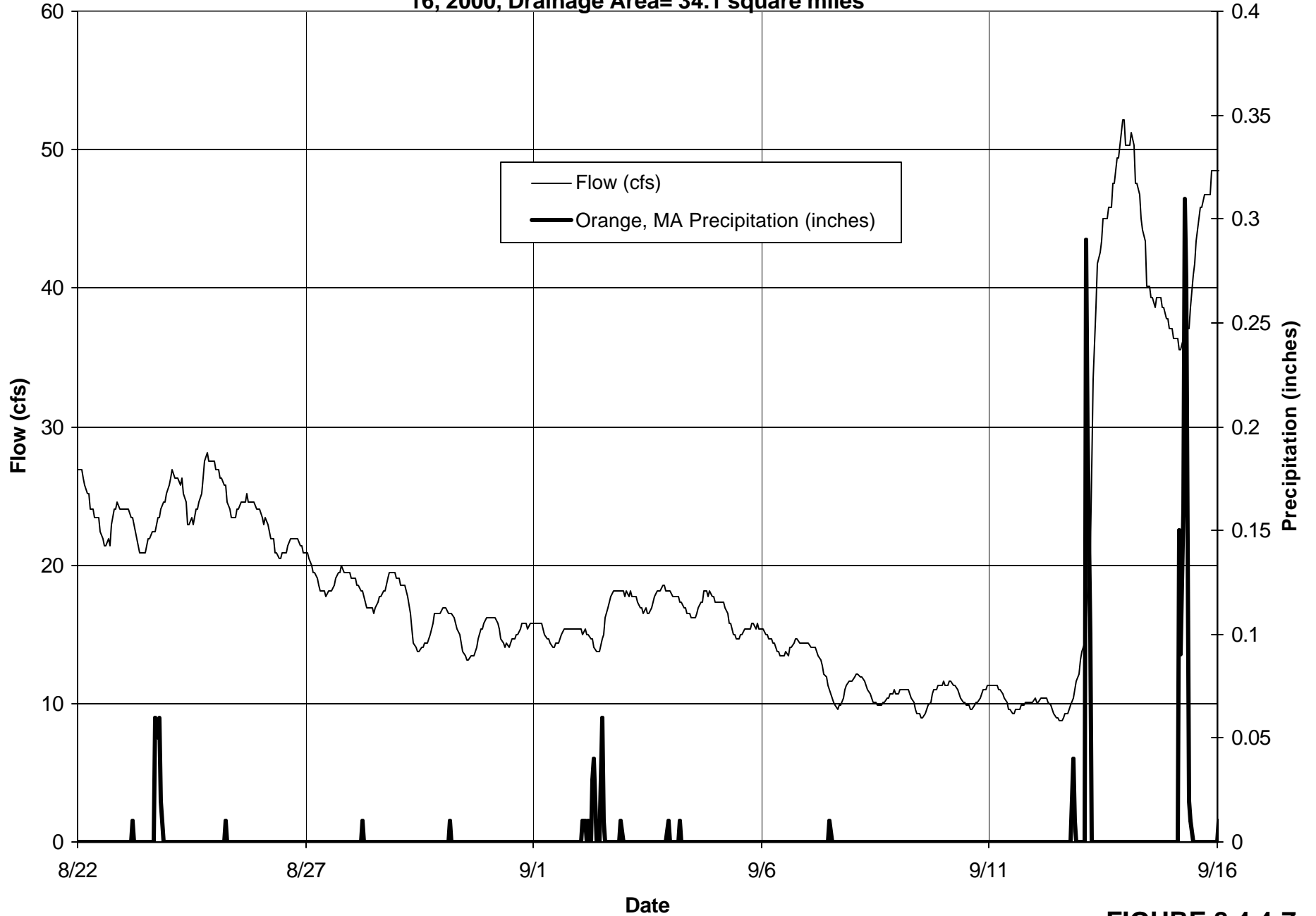
# Otter River at Otter River, MA, Hourly Hydrograph for Calendar Year 2000

Drainage Area= 34.1 square miles



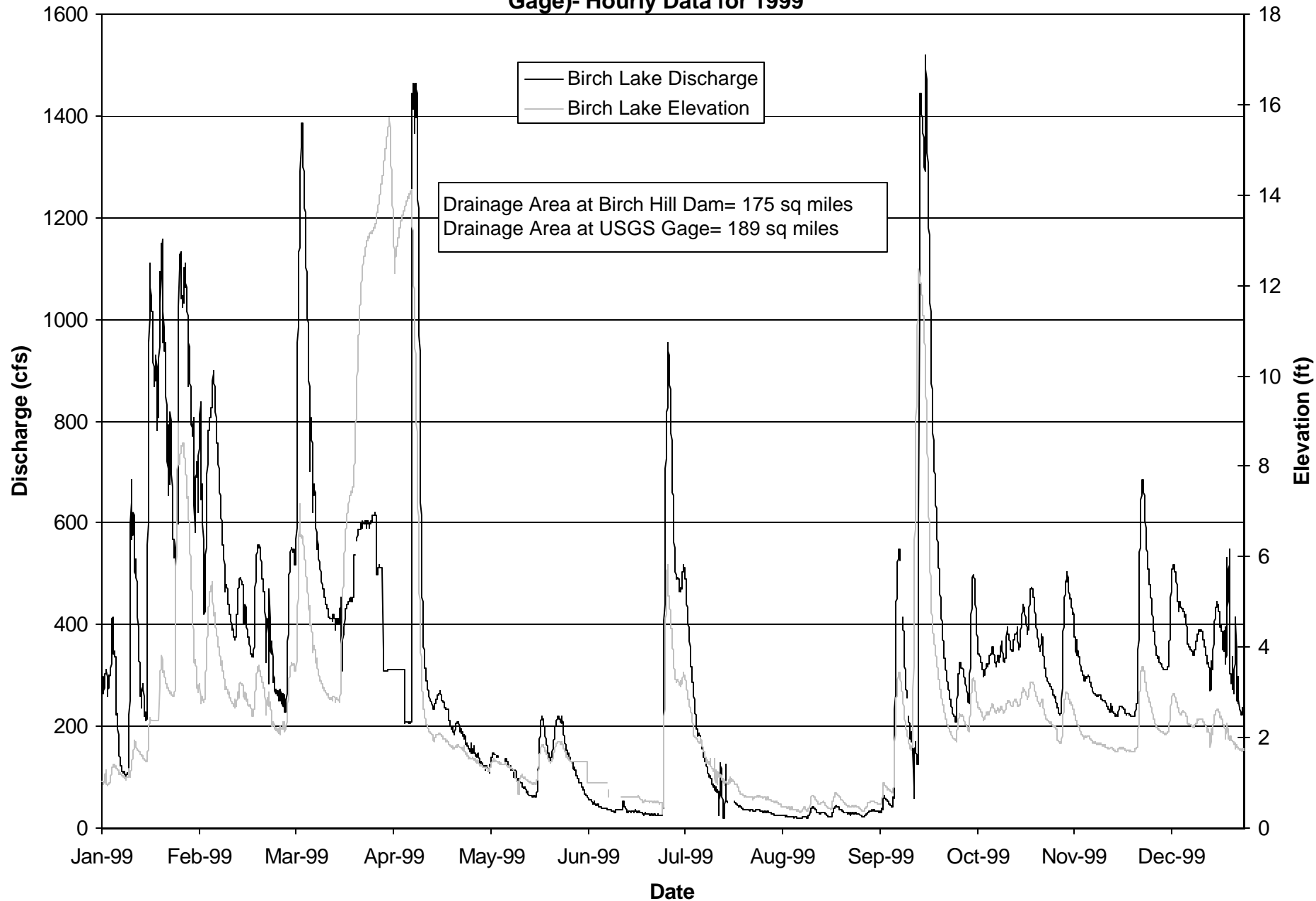
**FIGURE 8.4.4-6**

**Otter River at Otter River, MA, Hourly Hydrograph and Precipitation for August 22-September 16, 2000, Drainage Area= 34.1 square miles**



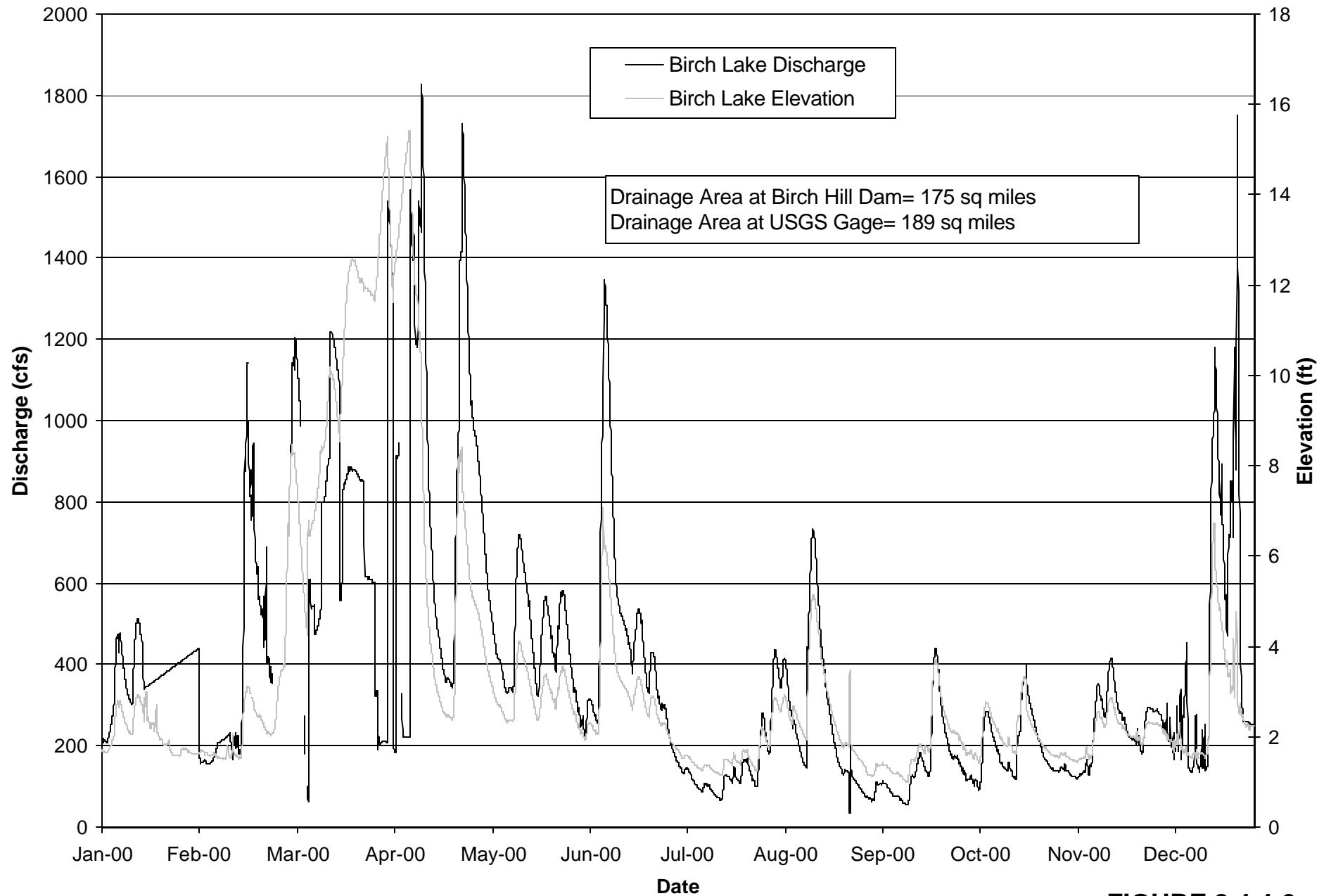
**FIGURE 8.4.4-7**

**Birch Hill Reservoir Elevation and Discharge (as recorded at the Millers River at South Royalston Gage)- Hourly Data for 1999**



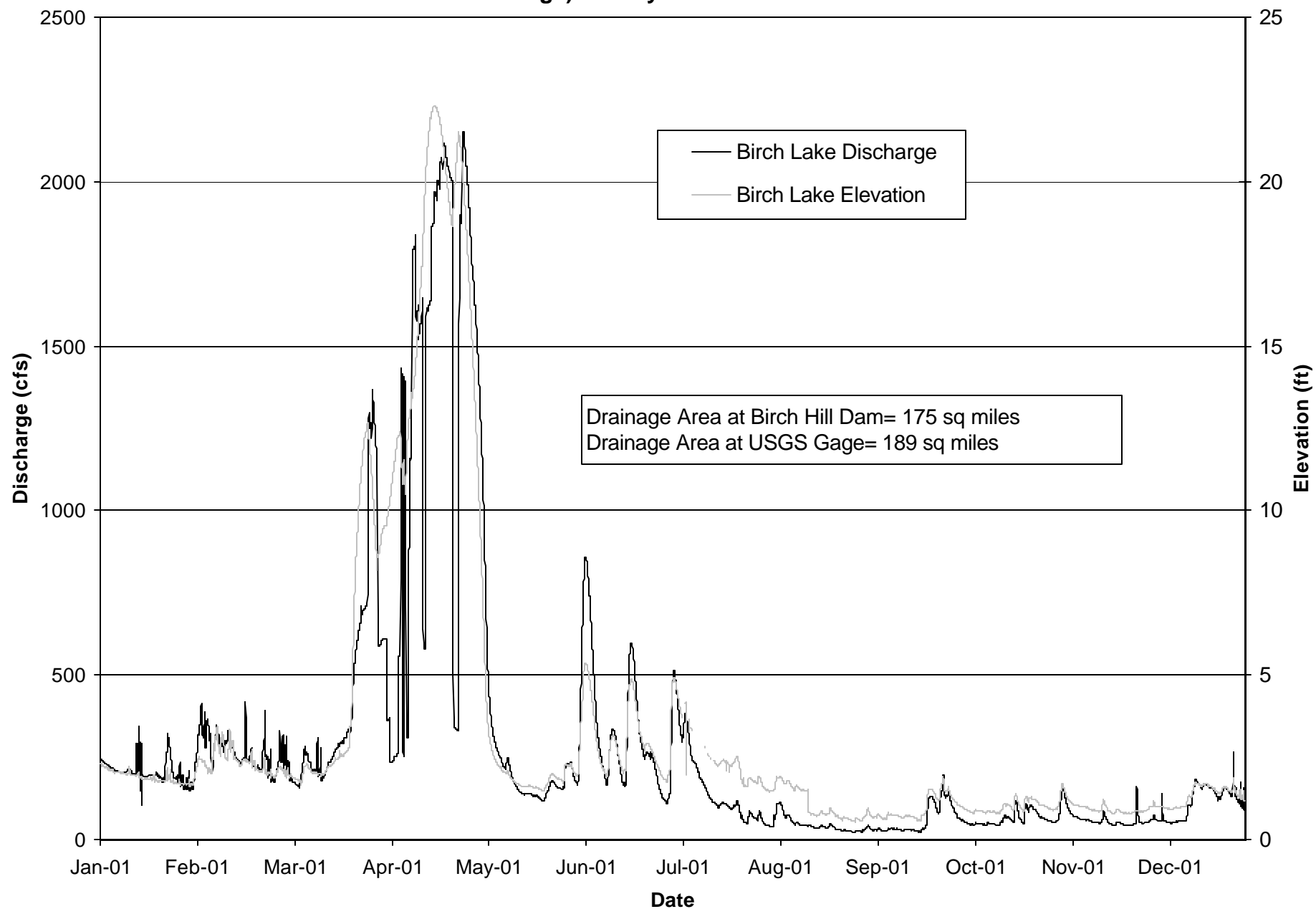
**FIGURE 8.4.4-8**

**Birch Hill Reservoir Elevation and Discharge (as recorded at the Millers River at South Royalston Gage)- Hourly Data for 2000**



**FIGURE 8.4.4-9**

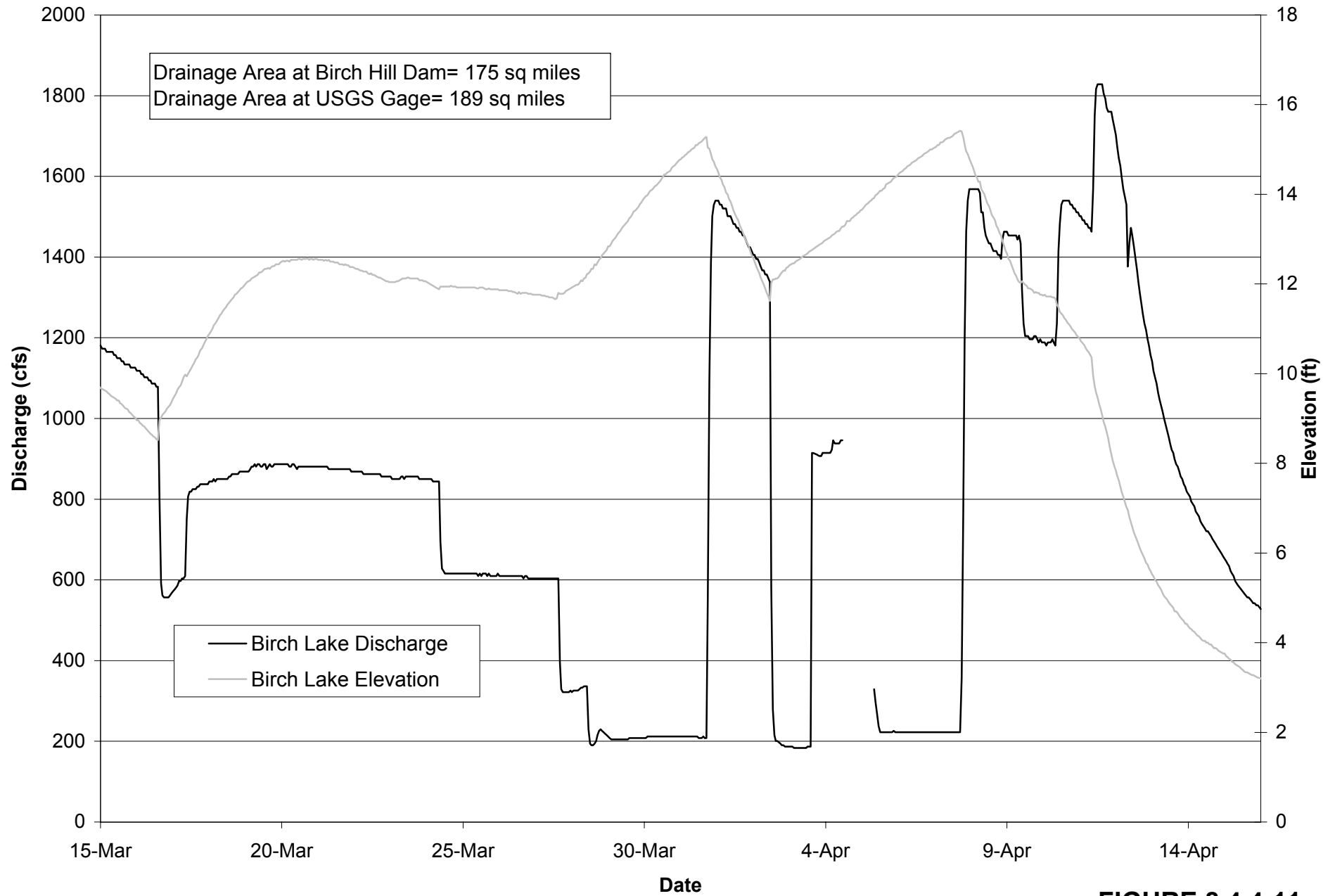
**Birch Hill Reservoir Elevation and Discharge (as recorded at the Millers River at South Royalston Gage)- Hourly Data for 2001**



**FIGURE 8.4.4-10**

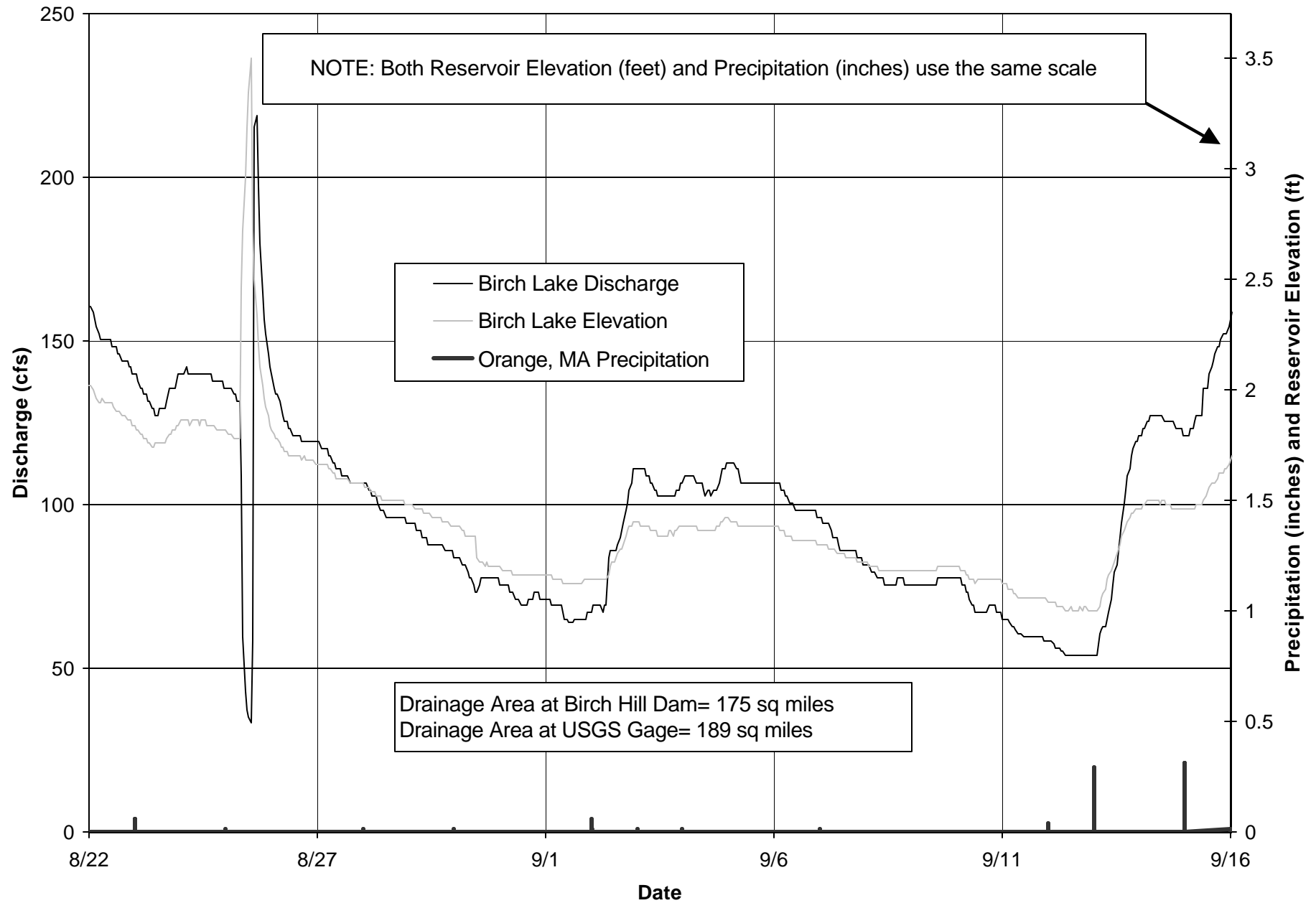


**Birch Hill Reservoir Elevation and Discharge (as recorded at the Millers River at South Royalston Gage)- Hourly Data for March 15-April 16, 2000**



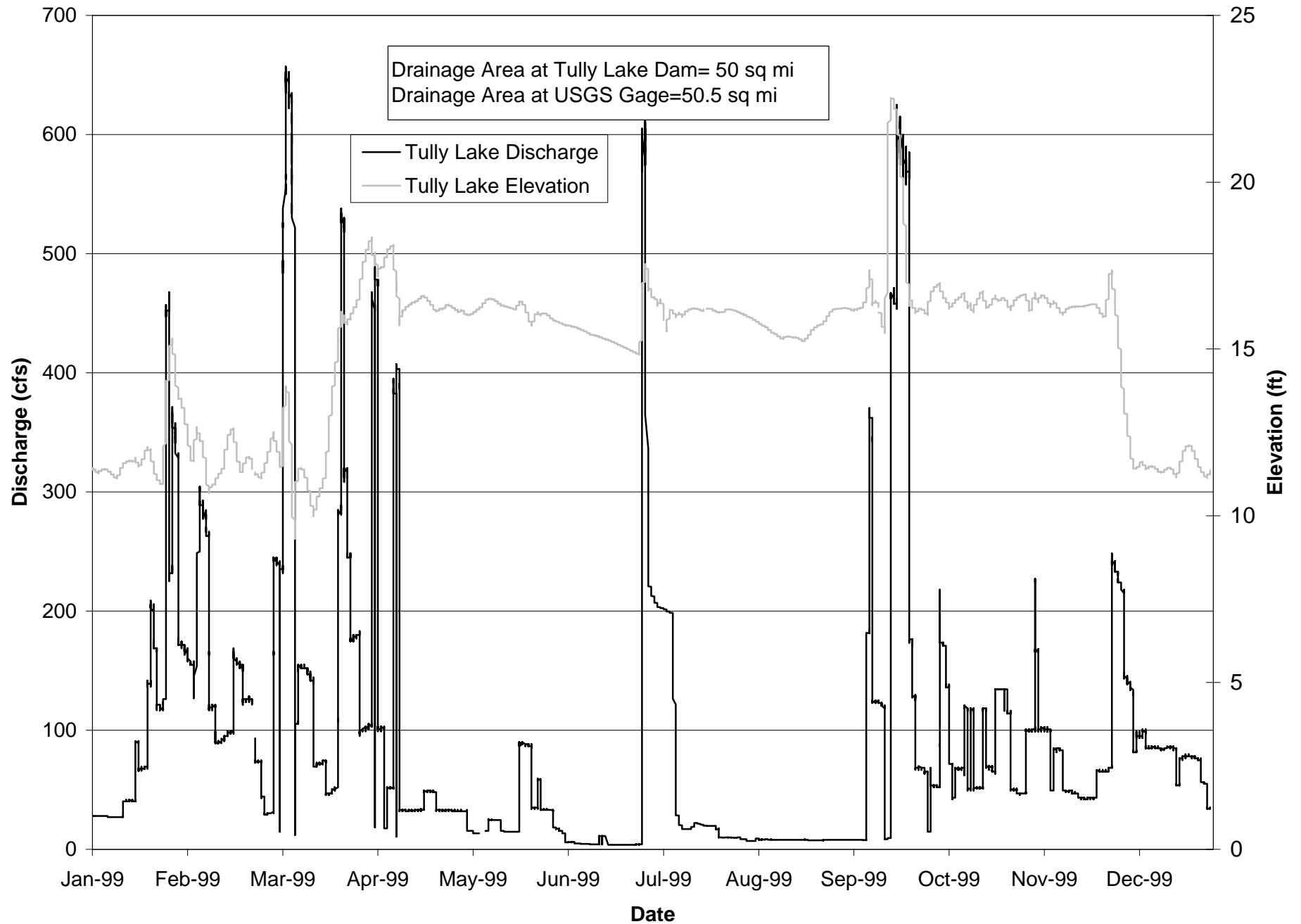
**FIGURE 8.4.4-11**

**Birch Hill Reservoir Elevation and Discharge (as recorded at the South Royalston Gage),  
Precipitation, Hourly Hydrographs for August 22-September 16, 2000**



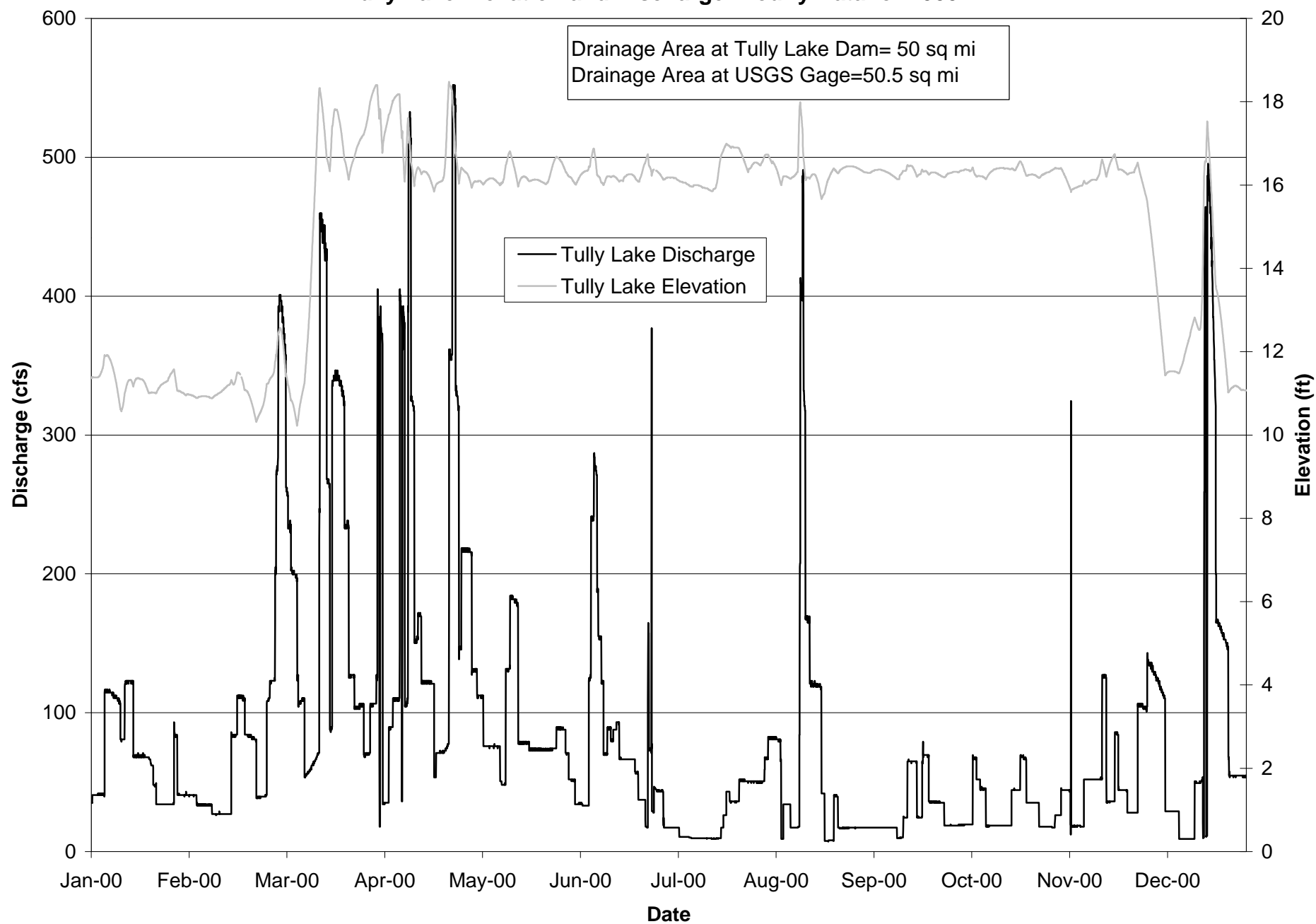
**FIGURE 8.4.4-12**

**Tully Lake Elevation and Discharge- Hourly Data for 1999**



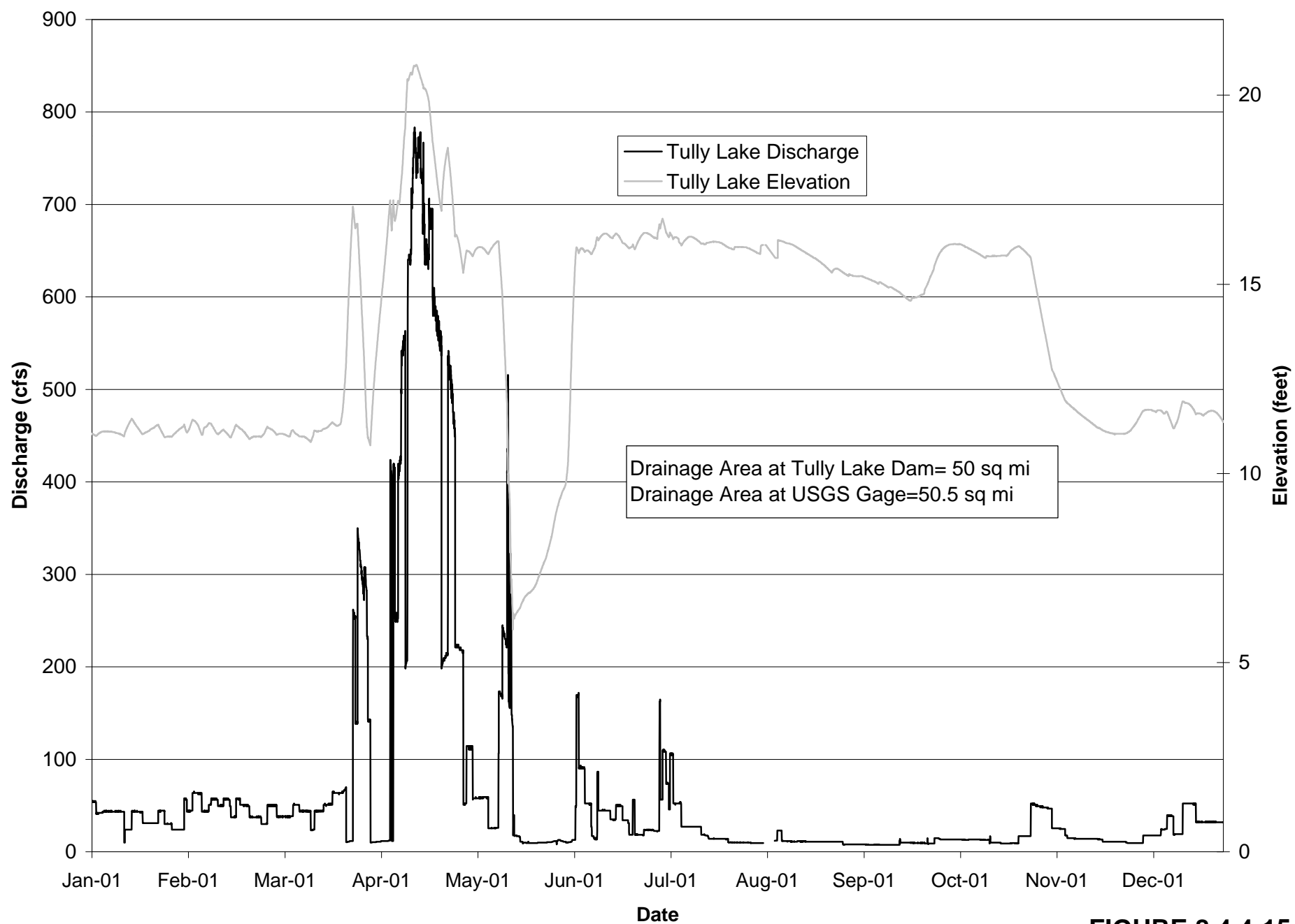
**FIGURE 8.4.4-13**

**Tully Lake Elevation and Discharge- Hourly Data for 2000**



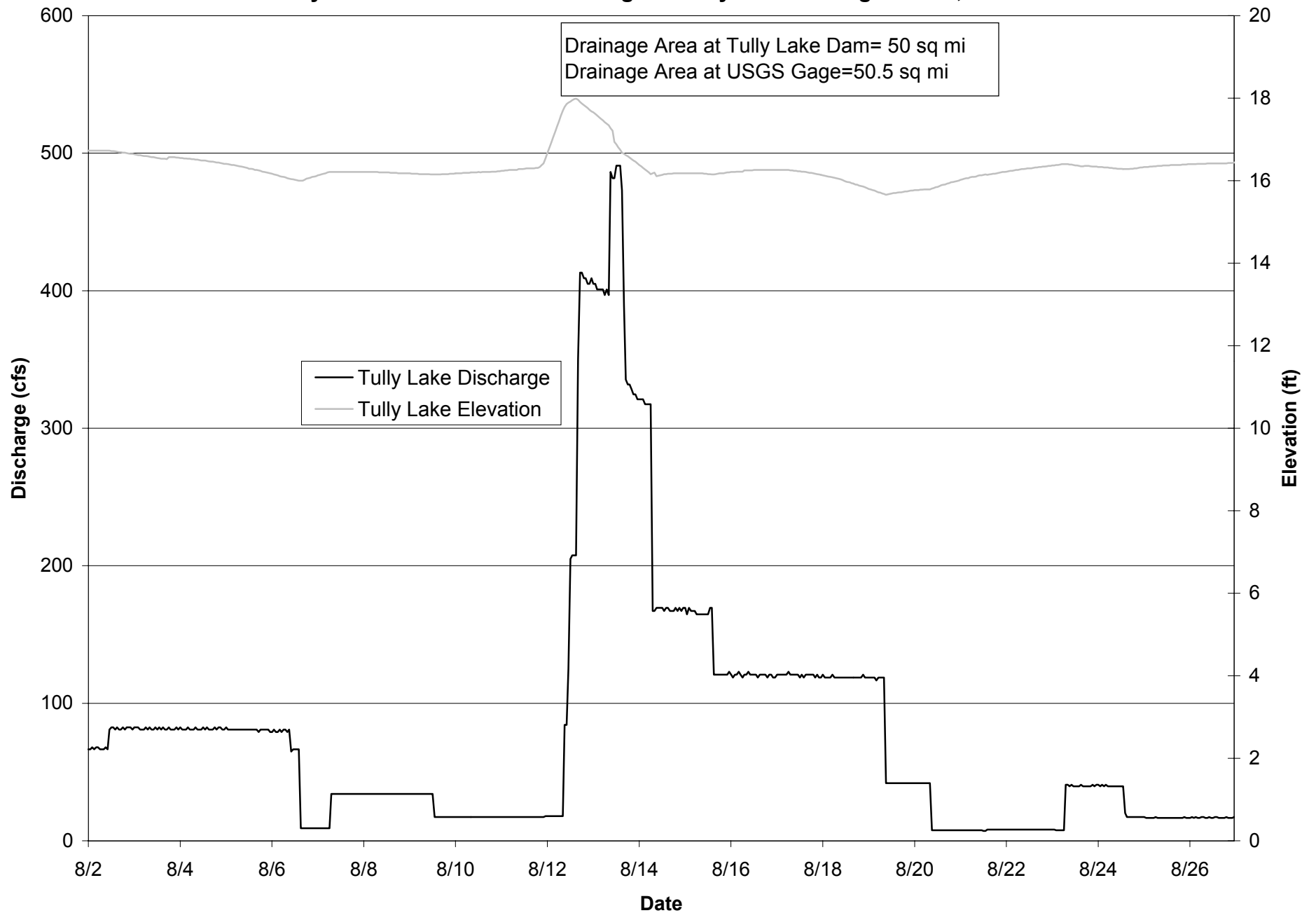
**FIGURE 8.4.4-14**

**Tully Lake Elevation and Discharge-Hourly Data for 2001**



**FIGURE 8.4.4-15**

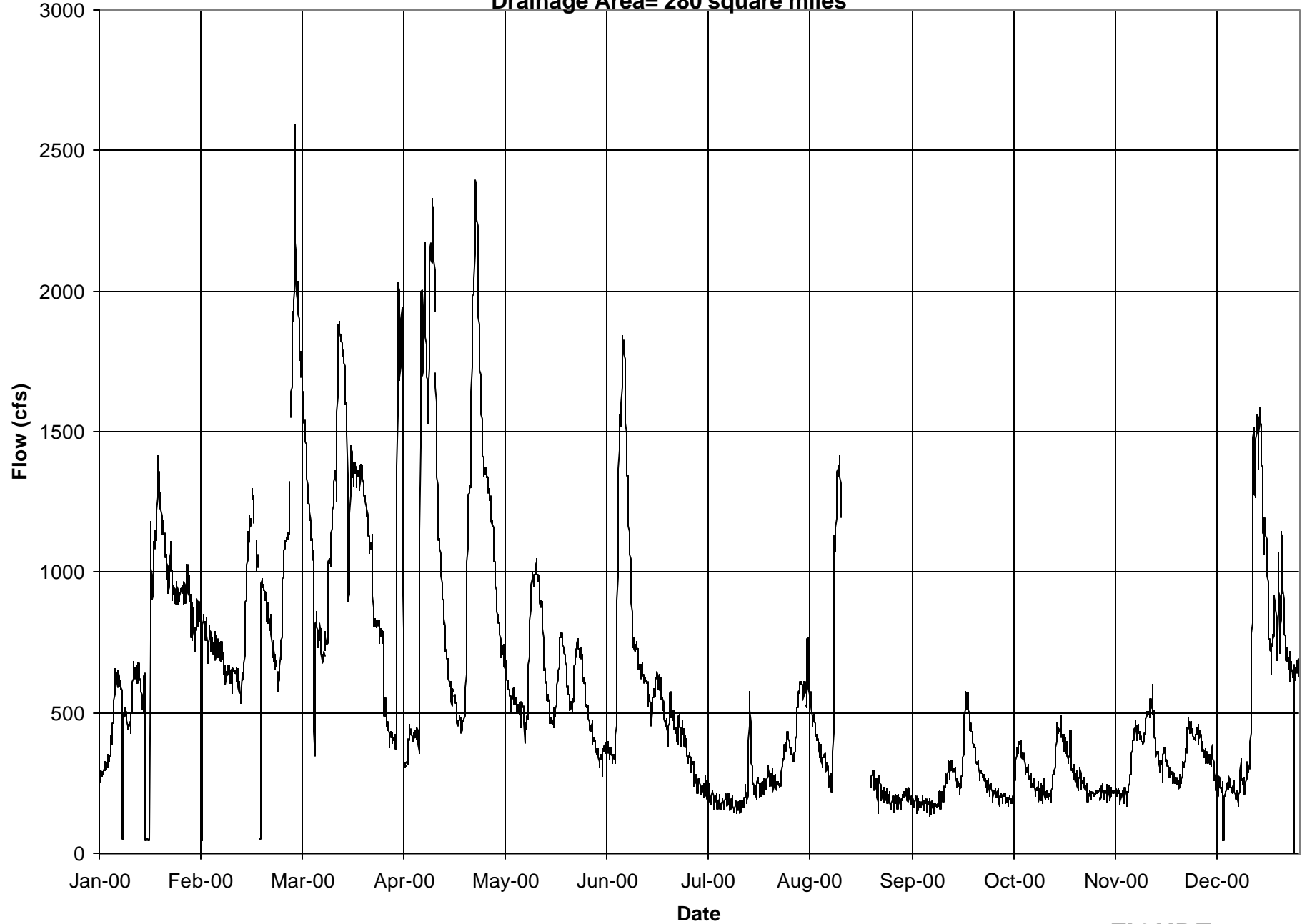
**Tully Lake Elevation and Discharge- Hourly Data for August 2-26, 2000**



**FIGURE 8.4.4-16**

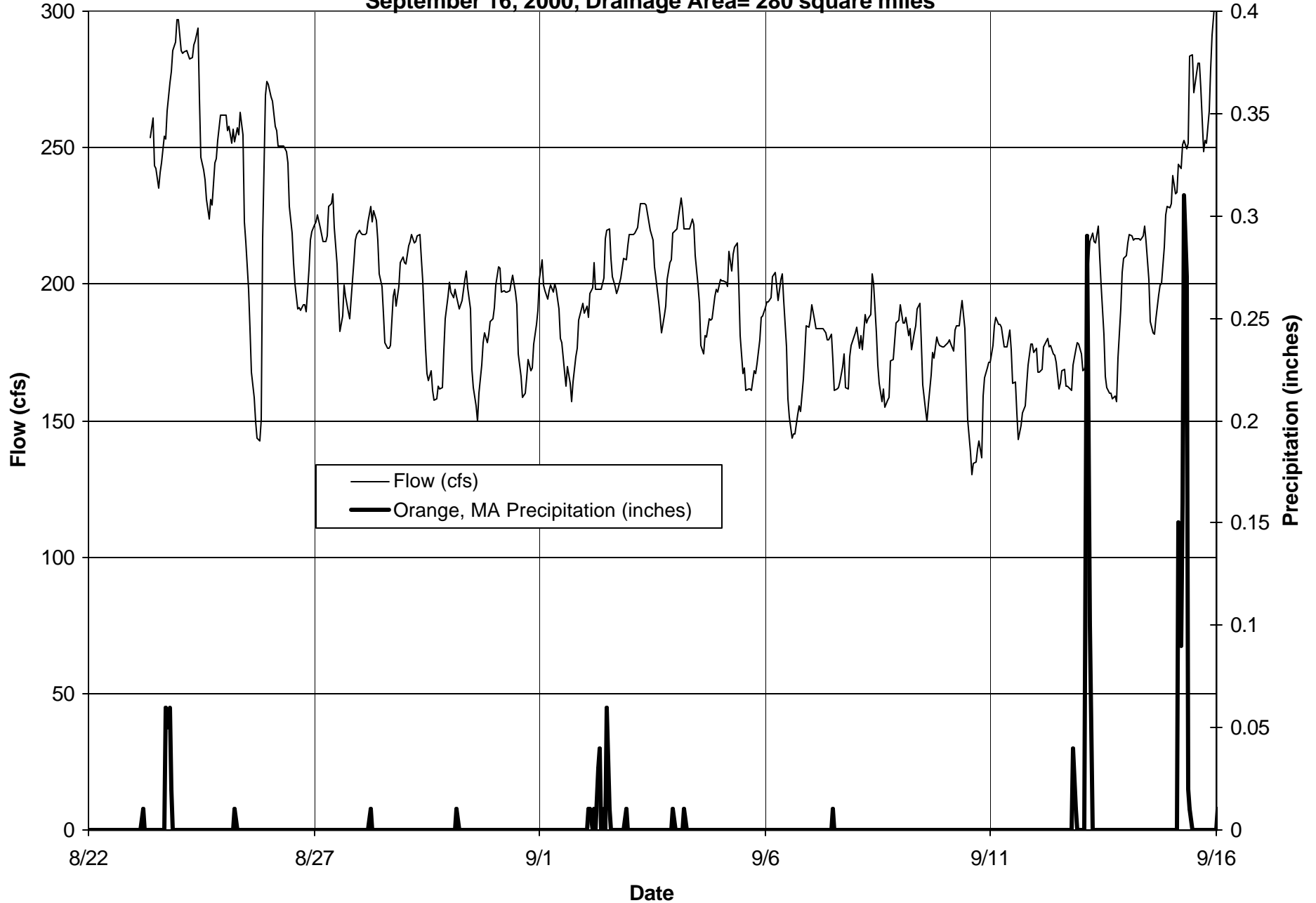
**Millers River at Athol, MA (Main Street Bridge), Hourly Hydrograph for Calendar Year 2000**

**Drainage Area= 280 square miles**



**FIGURE 8.4.4-17**

**Millers River at Athol, MA (Main Street Bridge), Hourly Hydrograph and Precipitation for August 22-September 16, 2000, Drainage Area= 280 square miles**

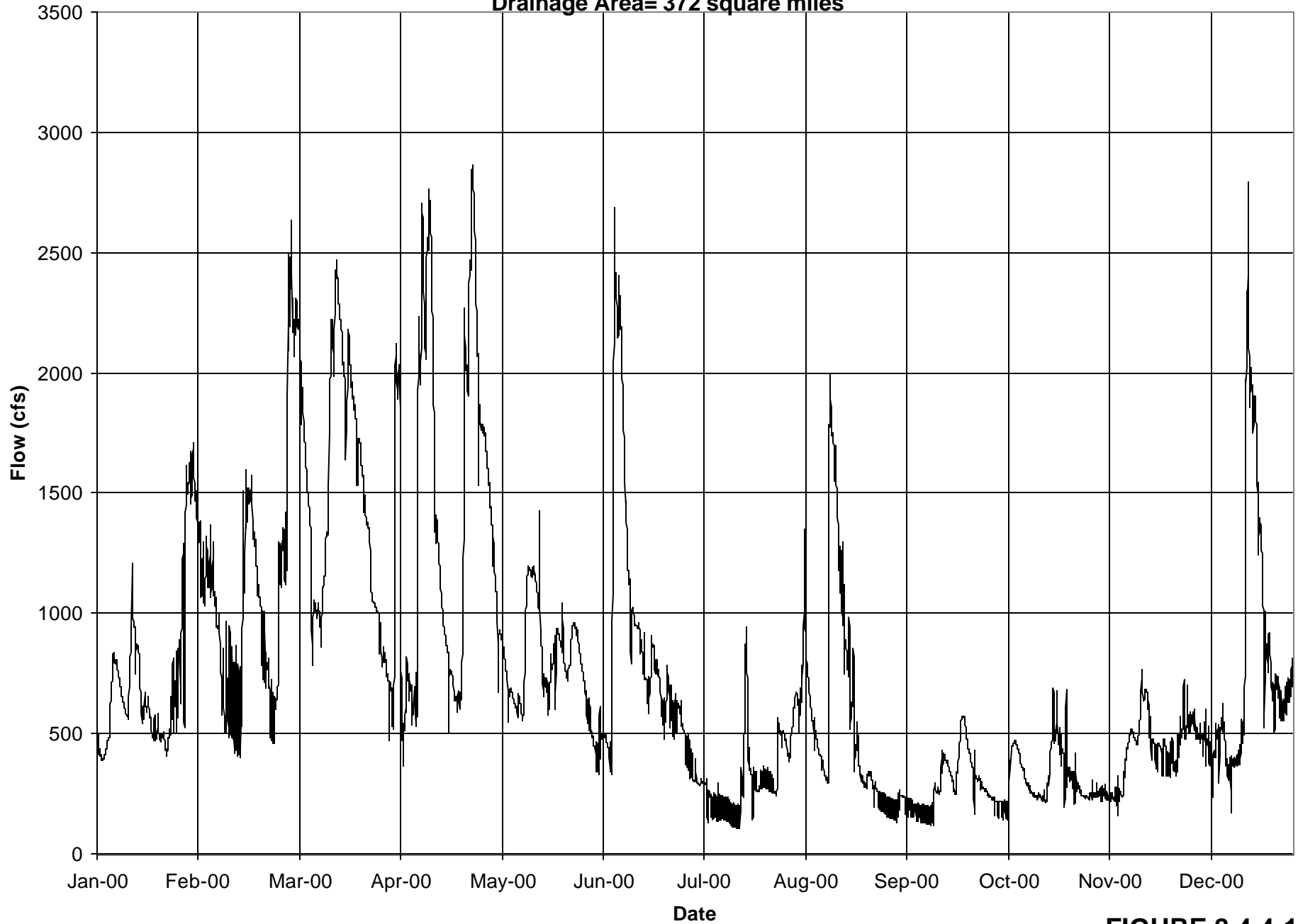


**FIGURE 8.4.4-18**



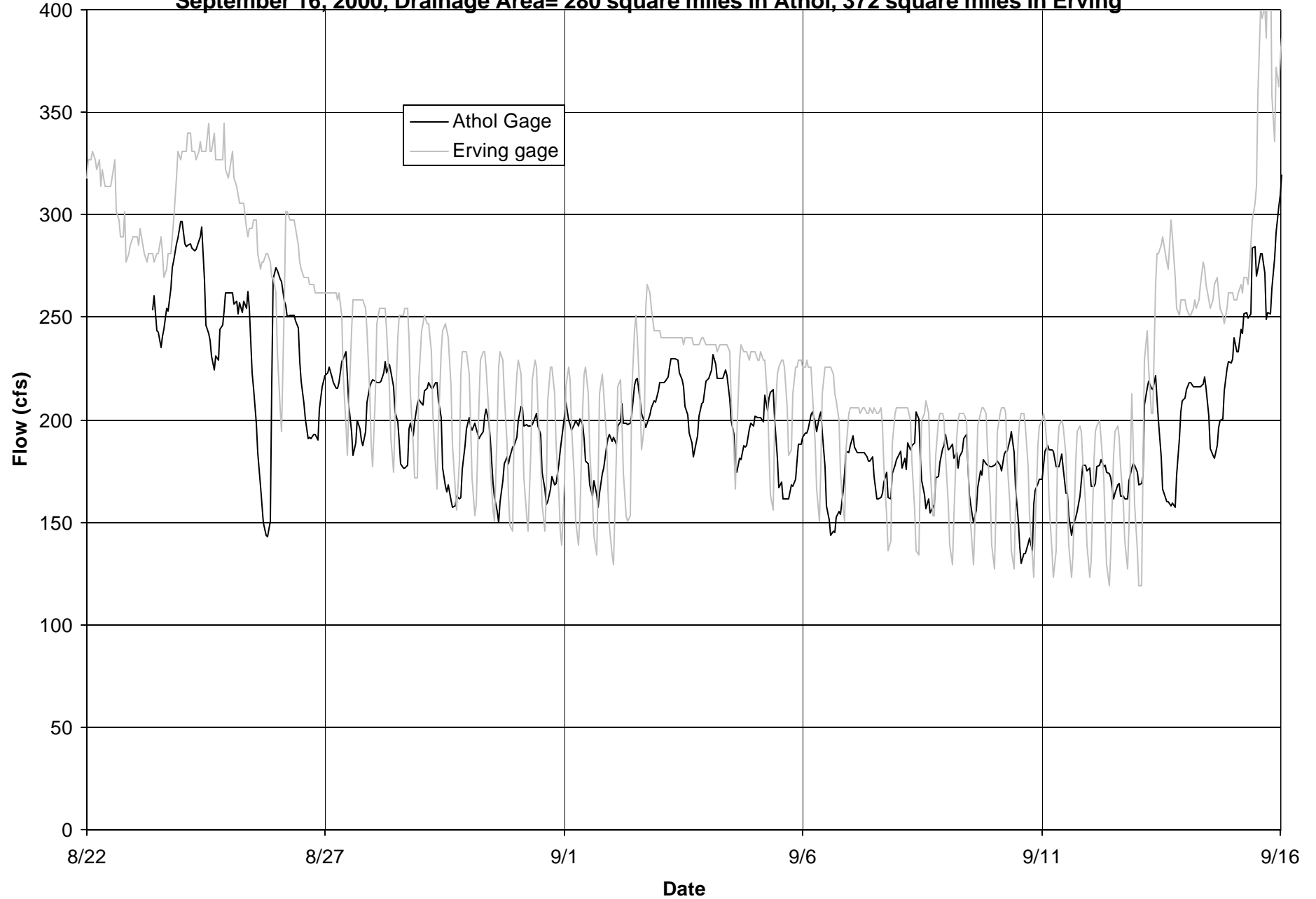
# Millers River at Erving, MA, Hourly Hydrograph for Calendar Year 2000

Drainage Area= 372 square miles



**FIGURE 8.4.4-19**

**Millers River at Athol, MA (Main Street Bridge) and Erving, Hourly Hydrograph for August 22-September 16, 2000, Drainage Area= 280 square miles in Athol, 372 square miles in Erving**



**FIGURE 8.4.4-20**

# IHA Parametric Scorecard East Branch of the Tully River

**TABLE 8.5.1.1-1**

	<i>Pre-impact period: 1917-1948 (32 years)</i>	<i>Post-impact period: 1949-1989 (41 years)</i>
Watershed Area (sq mi)	50.5	50.5
Mean Annual Flow (cfs)	83.34	79.59
Mean Flow/Area (cfs/sq mi)	1.650297	1.57604

	Mean		Coefficient of Variance		Deviation Factor		Deviation of Coefficient of Variance	
	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
<b>Parameter Group #1</b>								
October (cfs)	31.9	43.7	0.71	1.23	11.7	36.7	0.51	72.1
November (cfs)	68.4	70.4	0.74	0.75	2	2.9	0.01	1.2
December (cfs)	81	90	0.68	0.67	9	11.1	-0.02	-2.2
January (cfs)	74.2	71.8	0.59	0.6	-2.3	-3.2	0	0.4
February (cfs)	58.2	84.3	0.51	0.69	26.1	44.9	0.18	35.9
March (cfs)	182	134.3	0.53	0.49	-47.7	-26.2	-0.03	-6.2
April (cfs)	227.7	219.2	0.45	0.37	-8.5	-3.7	-0.07	-16.3
May (cfs)	115.6	109	0.45	0.47	-6.6	-5.7	0.01	2.9
June (cfs)	70.5	60.8	0.73	0.92	-9.7	-13.7	0.19	25.9
July (cfs)	38.2	26.8	1.03	0.91	-11.5	-30	-0.12	-11.5
August (cfs)	26.5	23.7	1.37	1.09	-2.7	-10.3	-0.28	-20.5
September (cfs)	35.7	23.2	1.97	1.1	-12.5	-34.9	-0.87	-44.2
Mean [%] change					18.6		19.9	
<b>Parameter Group #2</b>								
1-day minimum (cfs)	3.8	3	0.64	1.17	-0.8	-21.9	0.52	81.6
3-day minimum (cfs)	4.1	3.7	0.67	1.02	-0.4	-8.7	0.35	52.6
7-day minimum (cfs)	4.9	4.3	0.86	0.92	-0.7	-14.1	0.05	6.4
30-day minimum (cfs)	8.8	7.6	0.9	0.93	-1.2	-13.2	0.03	3.4
90-day minimum (cfs)	18.5	16.3	0.91	0.82	-2.2	-11.7	-0.09	-10.4
1-day maximum (cfs)	858.7	499.5	0.82	0.25	-359.1	-41.8	-0.57	-69.7
3-day maximum (cfs)	698.1	469.3	0.7	0.25	-228.9	-32.8	-0.45	-63.9
7-day maximum (cfs)	524.6	408.4	0.52	0.29	-116.2	-22.1	-0.23	-44.8
30-day maximum (cfs)	308.7	265.6	0.33	0.28	-43.1	-14	-0.05	-14.4
90-day maximum (cfs)	189.7	174	0.24	0.24	-15.7	-8.3	0	-1.3
Base flow (cfs)	0.1	0.1	0.54	0.91	0	-5	0.37	69.3
Mean [%] change					17.6		38	
<b>Parameter Group #3</b>								
Date of minimum (julian date)	251.9	233.5	0.06	0.21	18.5	10.1	0.15	253.6
Date of maximum (julian date)	82.2	126.6	0.16	0.23	44.4	24.3	0.07	46
Mean [%] change					17.2		149.8	
<b>Parameter Group #4</b>								
Low pulse count (#)	6.7	7	0.46	0.35	0.3	5	-0.11	-23.7
Low pulse duration (days)	14	13.7	1.04	0.5	-0.4	-2.6	-0.53	-51.4
High pulse count (#)	6.1	6.3	0.52	0.53	0.1	2.3	0.01	1.7
High pulse duration (days)	6.7	6.2	0.48	0.38	-0.6	-8.3	-0.09	-19.6
Mean [%] change					4.6		24.1	
<b>Parameter Group #5</b>								
Rise rate (cfs/day)	28.1	25.6	0.43	0.4	-2.5	-8.8	-0.03	-7.2
Fall rate (cfs/day)	-13.9	-18	-0.41	-0.48	-4	28.9	-0.07	17.6
Number of reversals (#)	88.8	72.1	0.12	0.21	-16.6	-18.7	0.09	73.2
Mean [%] change					18.8		32.7	

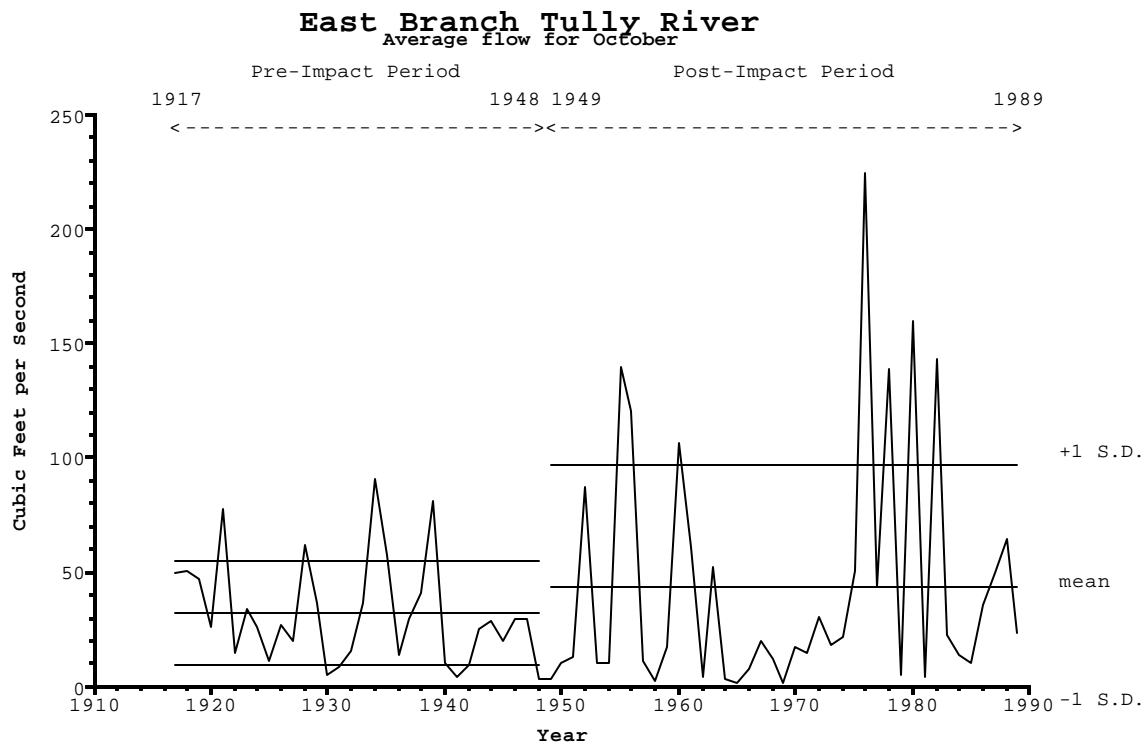


Figure 8.5.1.1-1

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

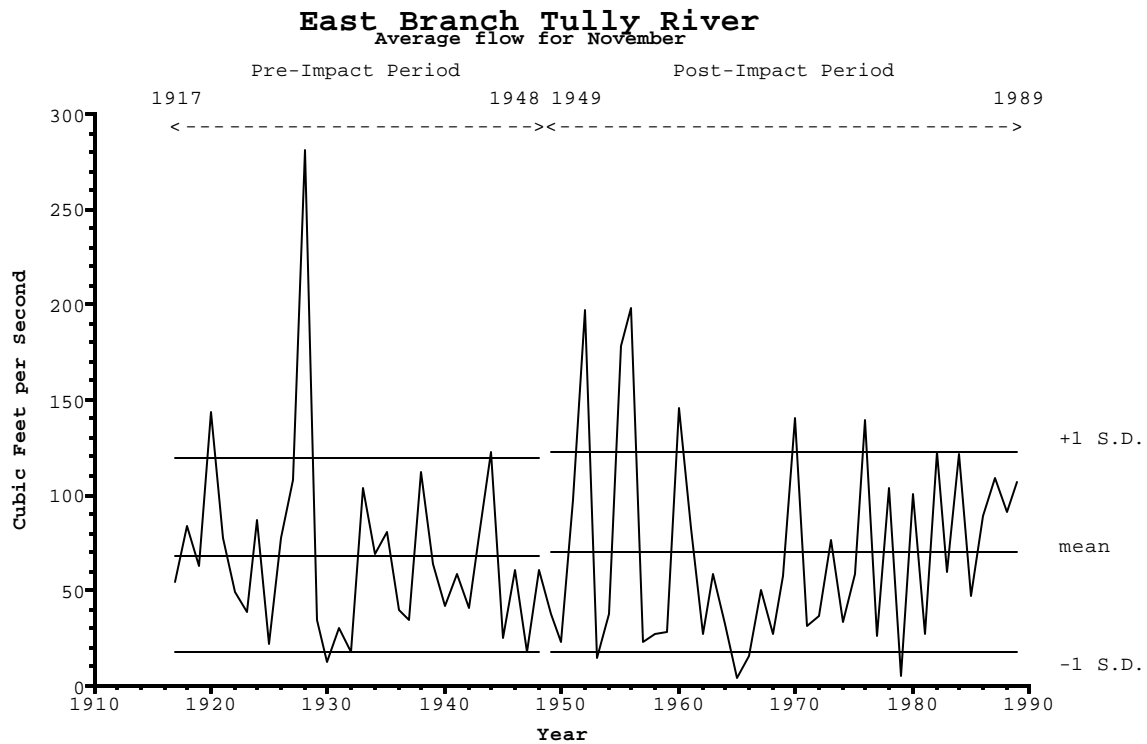


Figure 8.5.1.1-2

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

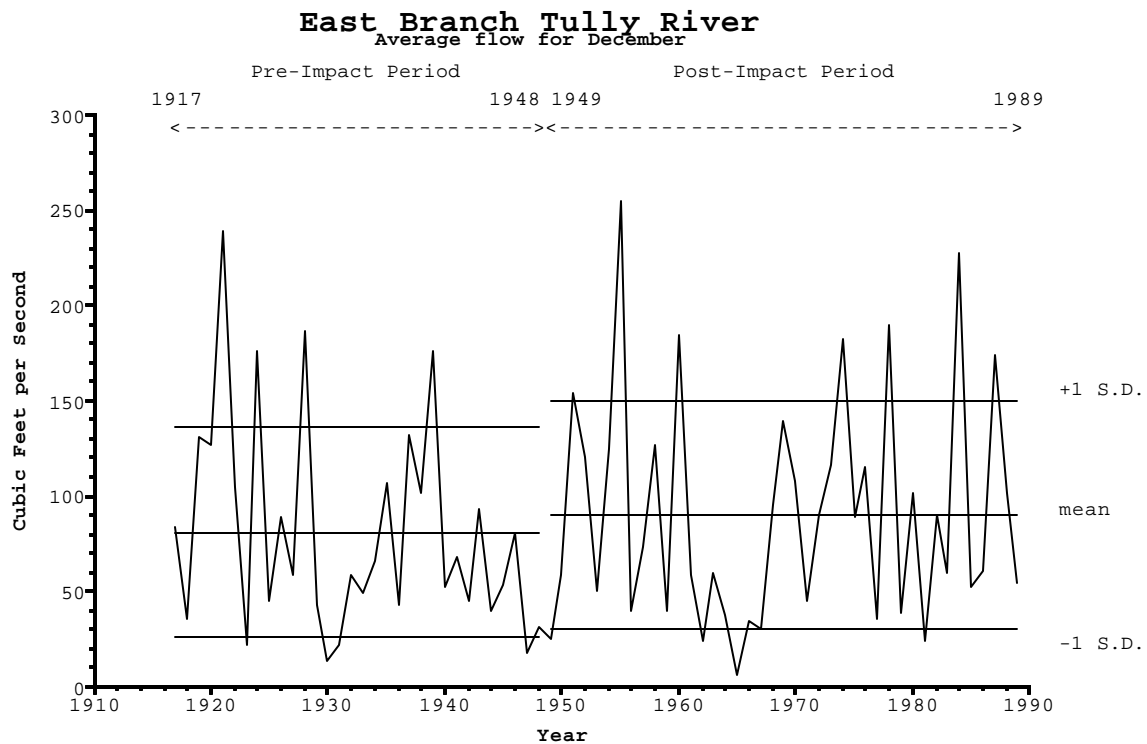


Figure 8.5.1.1-3

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

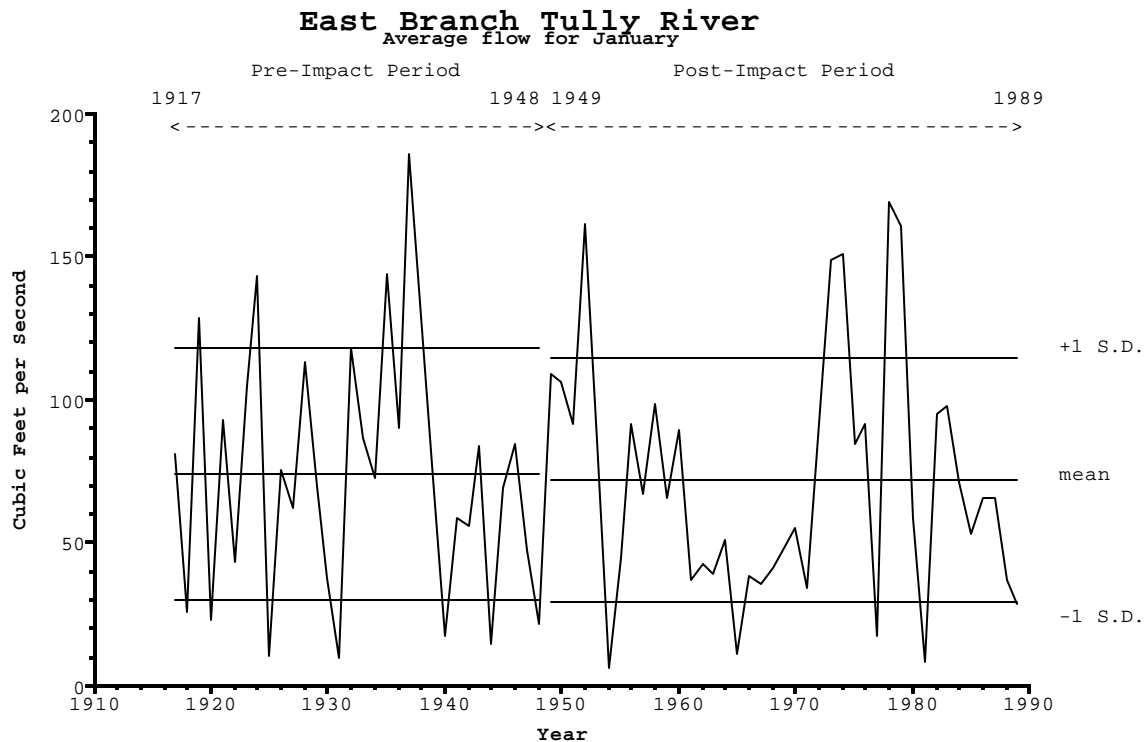


Figure 8.5.1.1-4

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

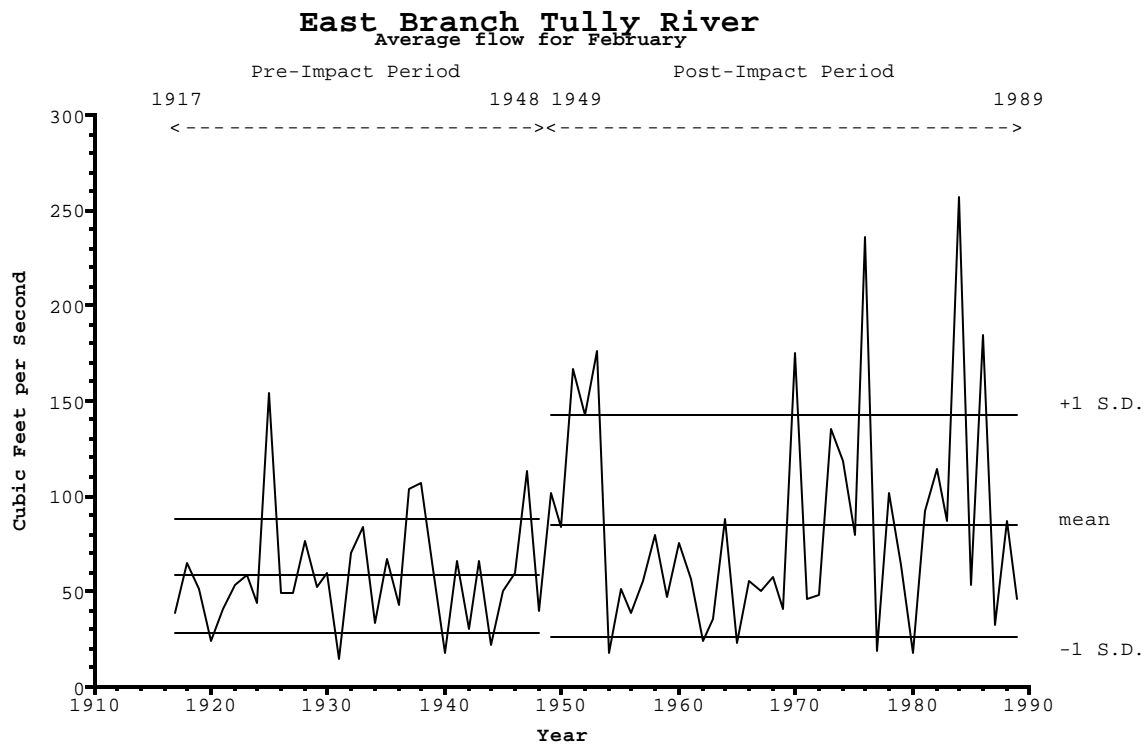


Figure 8.5.1.1-5

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

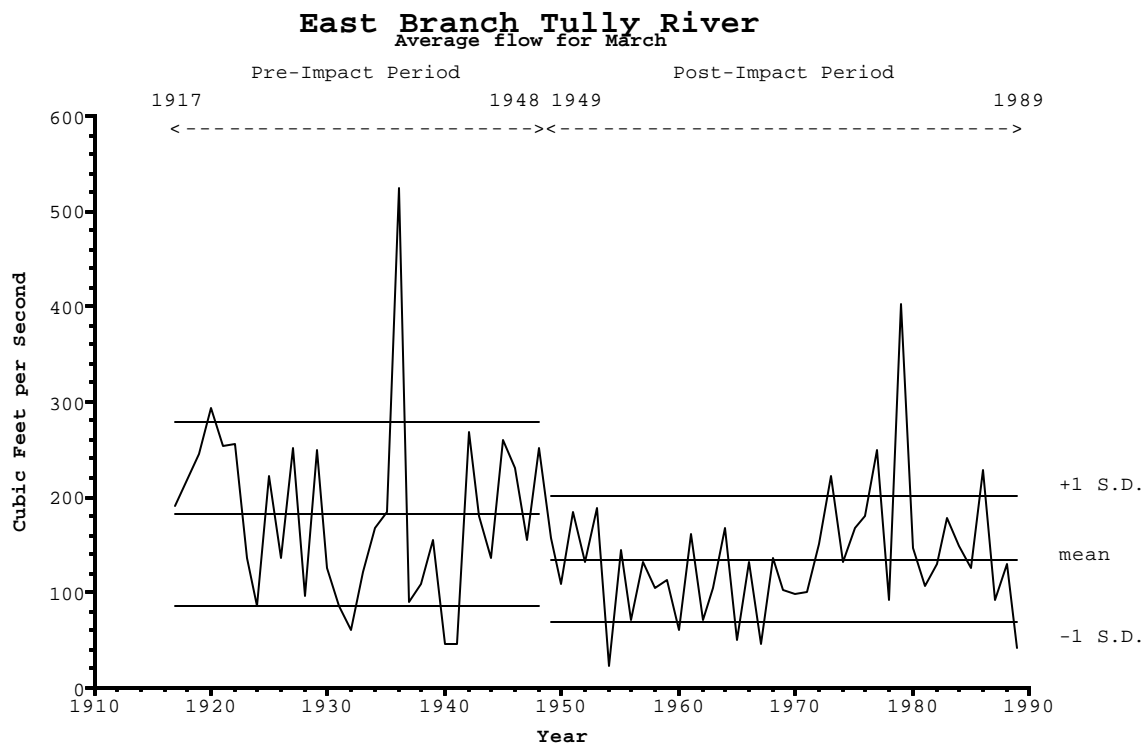


Figure 8.5.1.1-6

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

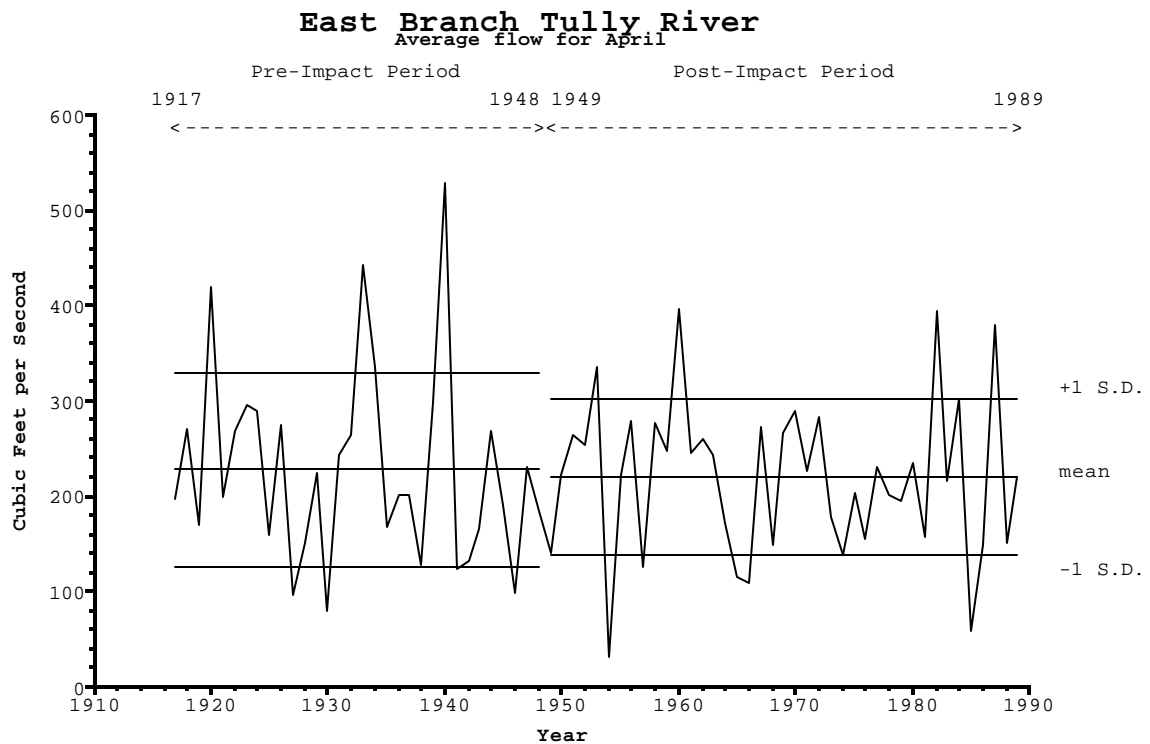


Figure 8.5.1.1-7

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

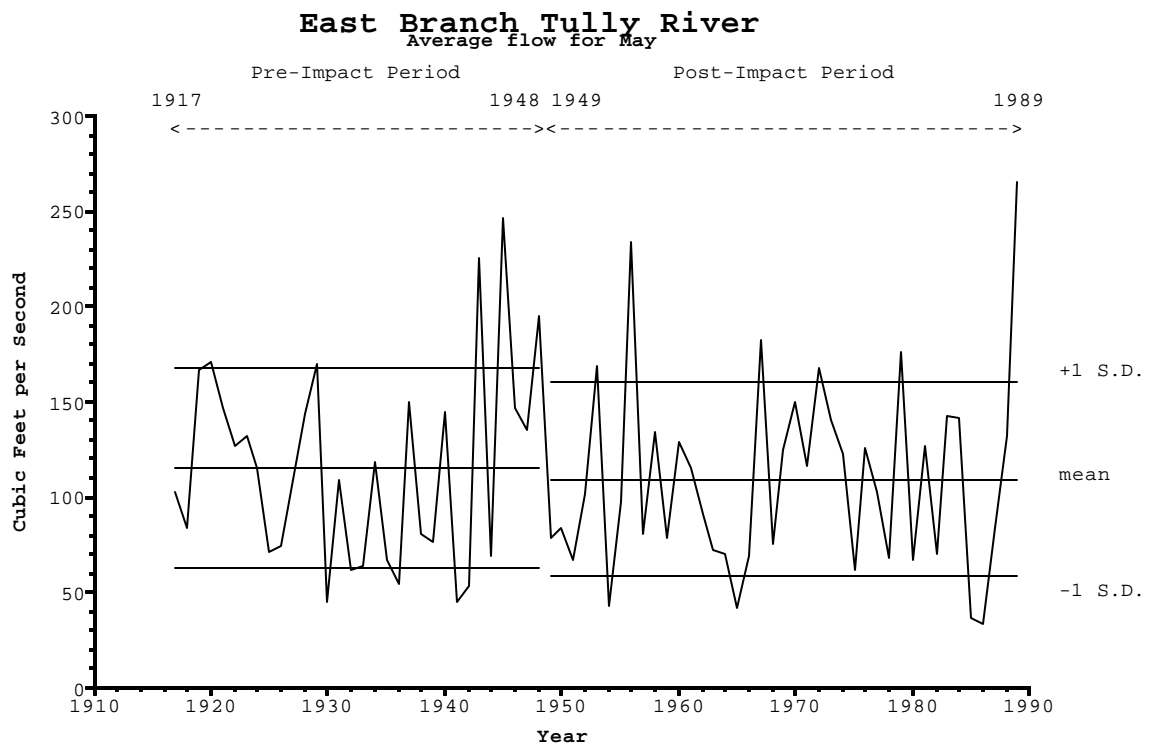


Figure 8.5.1.1-8

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

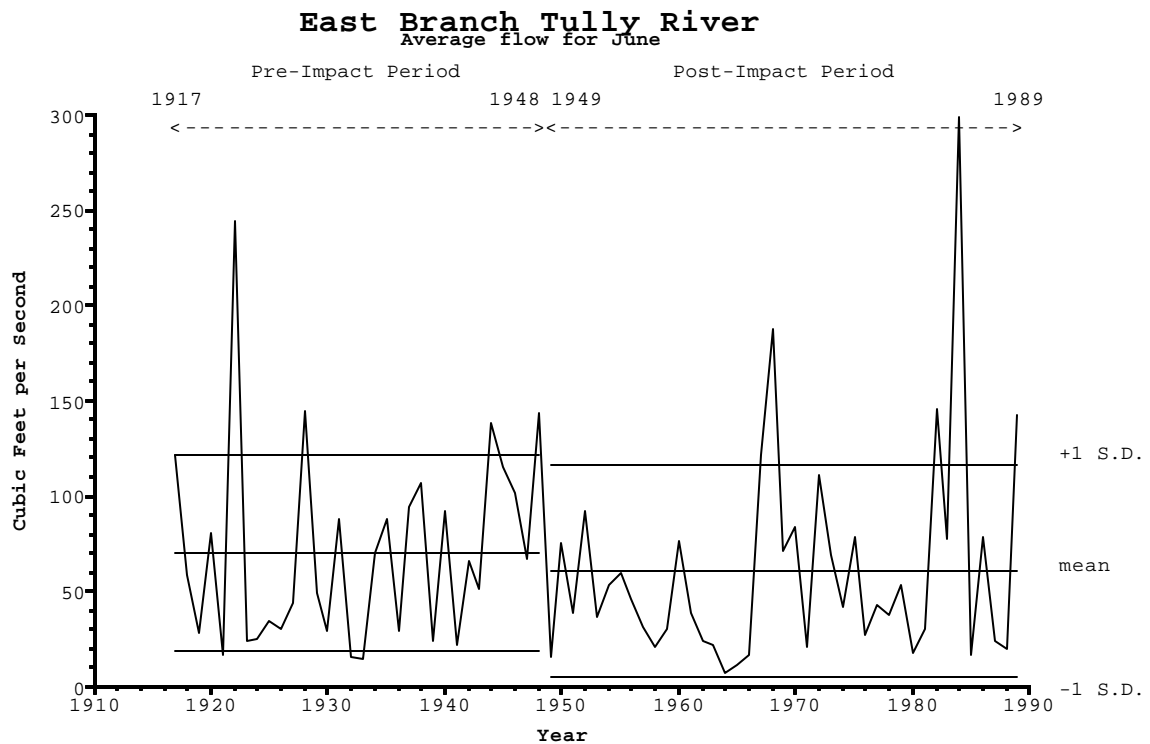


Figure 8.5.1.1-9

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

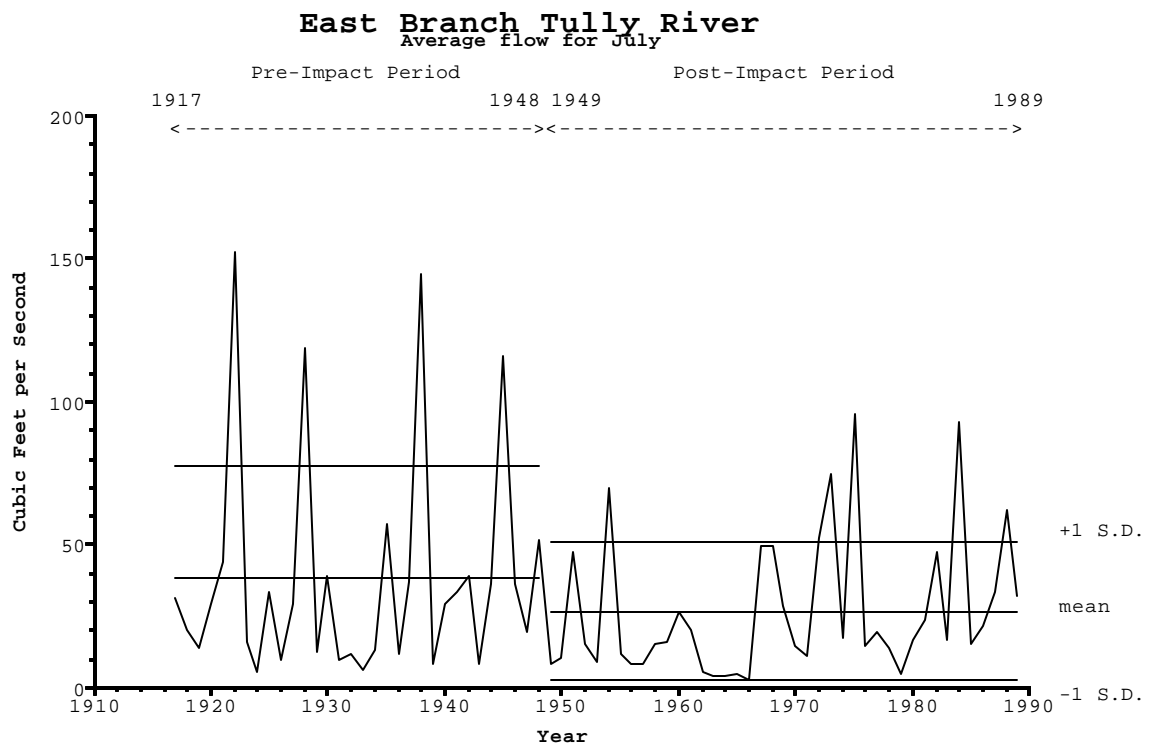


Figure 8.5.1.1-10

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw



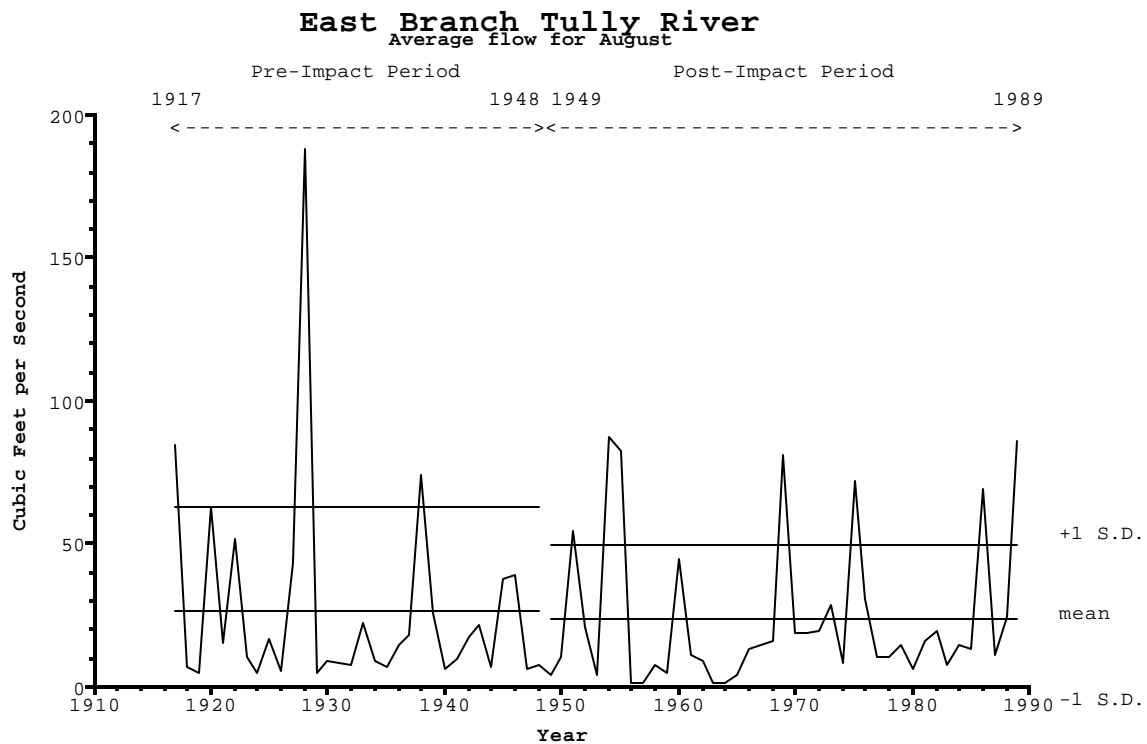


Figure 8.5.1.1-11

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

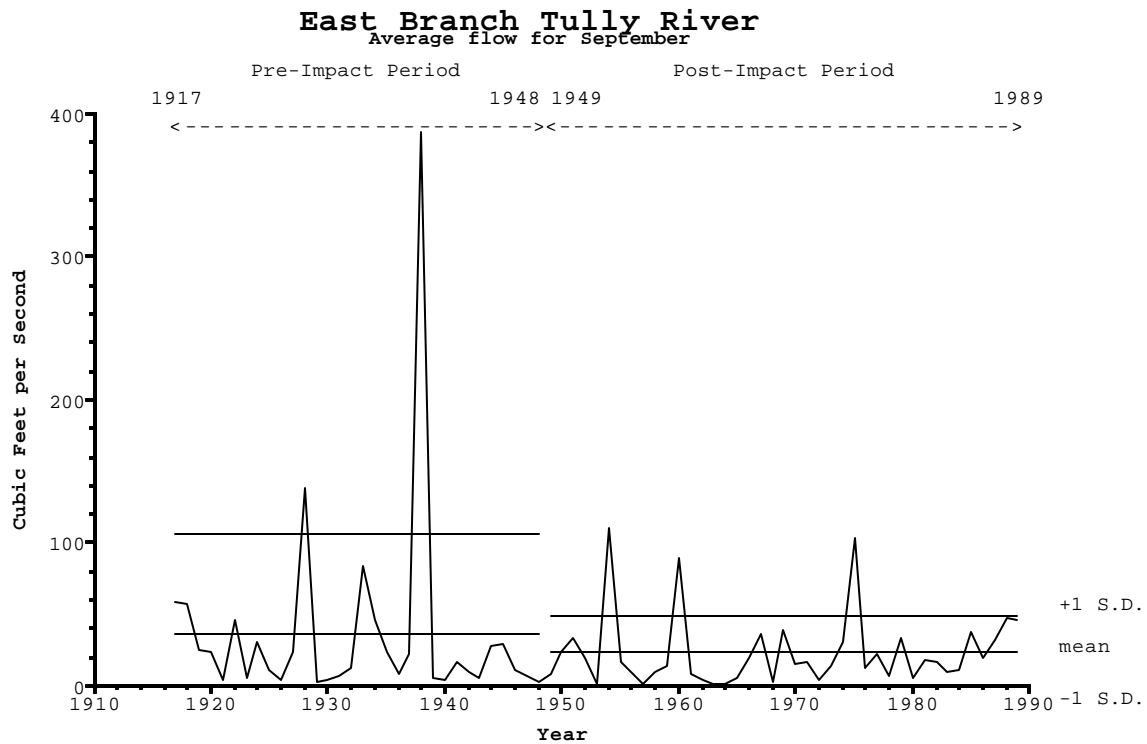


Figure 8.5.1.1-12

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

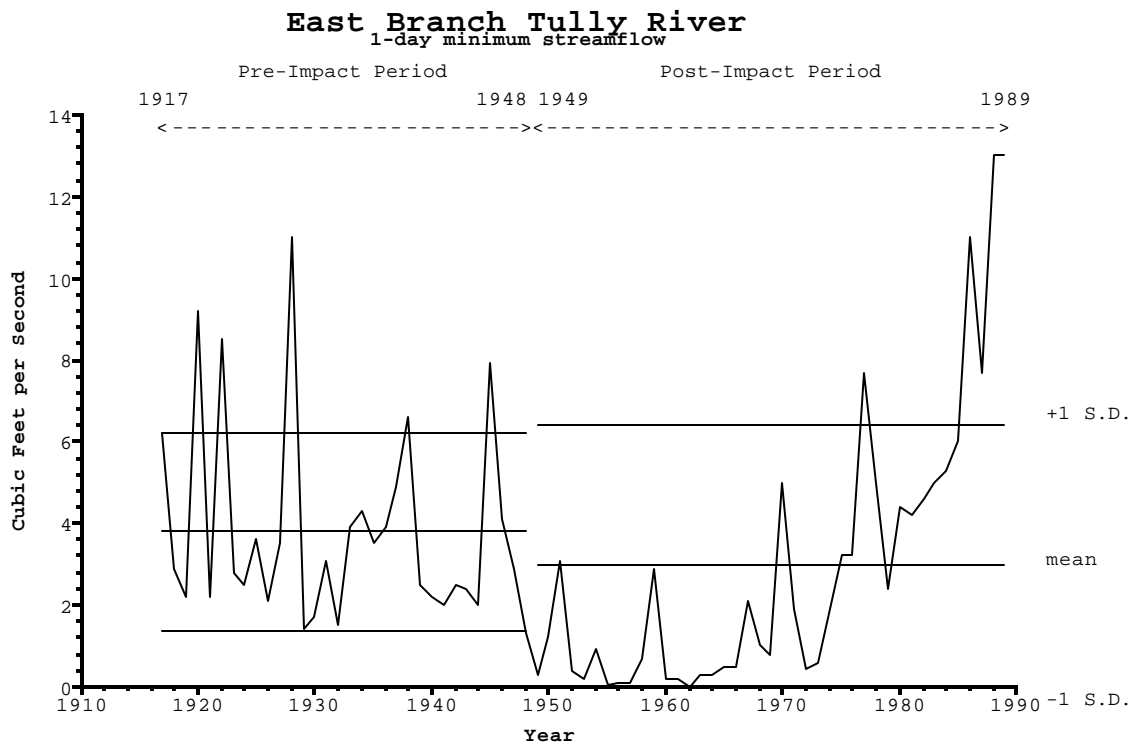


Figure 8.5.1.1-13

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

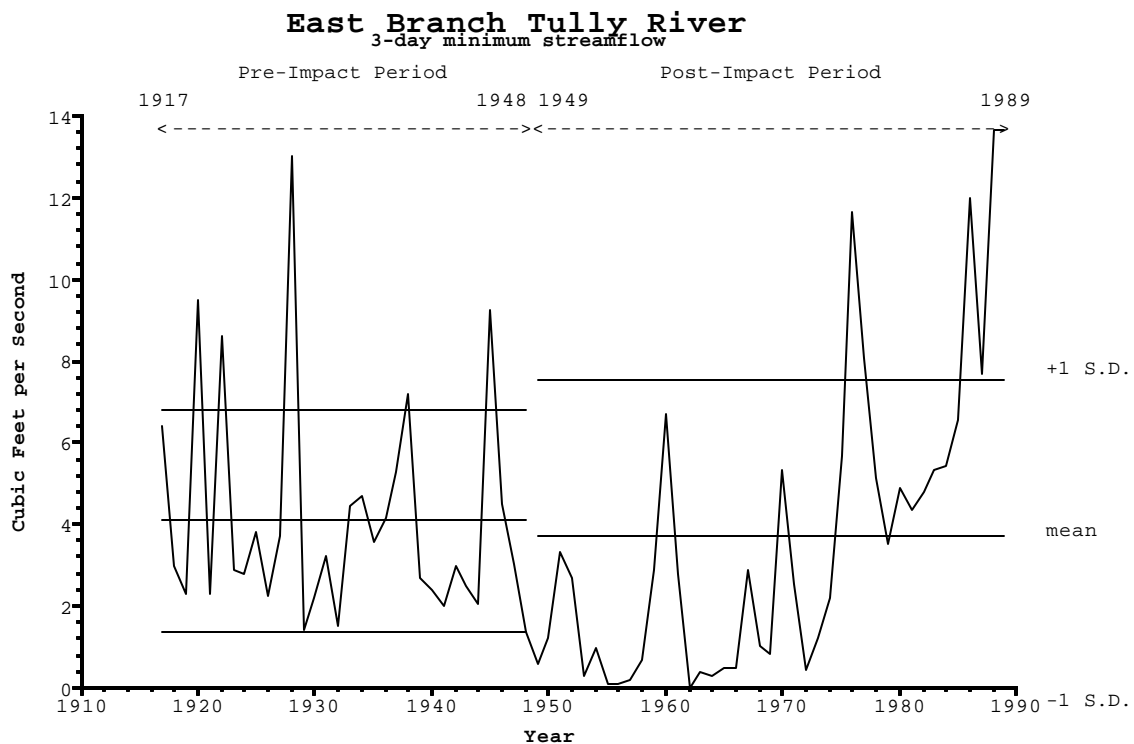


Figure 8.5.1.1-14

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

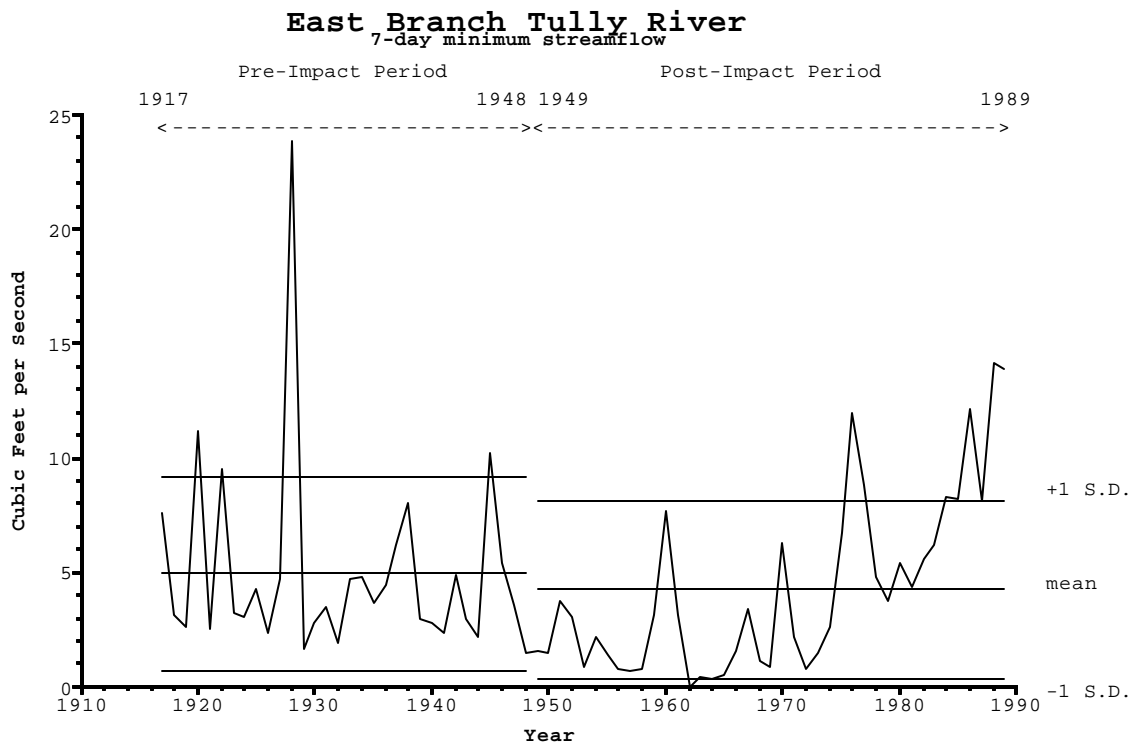


Figure 8.5.1.1-15

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

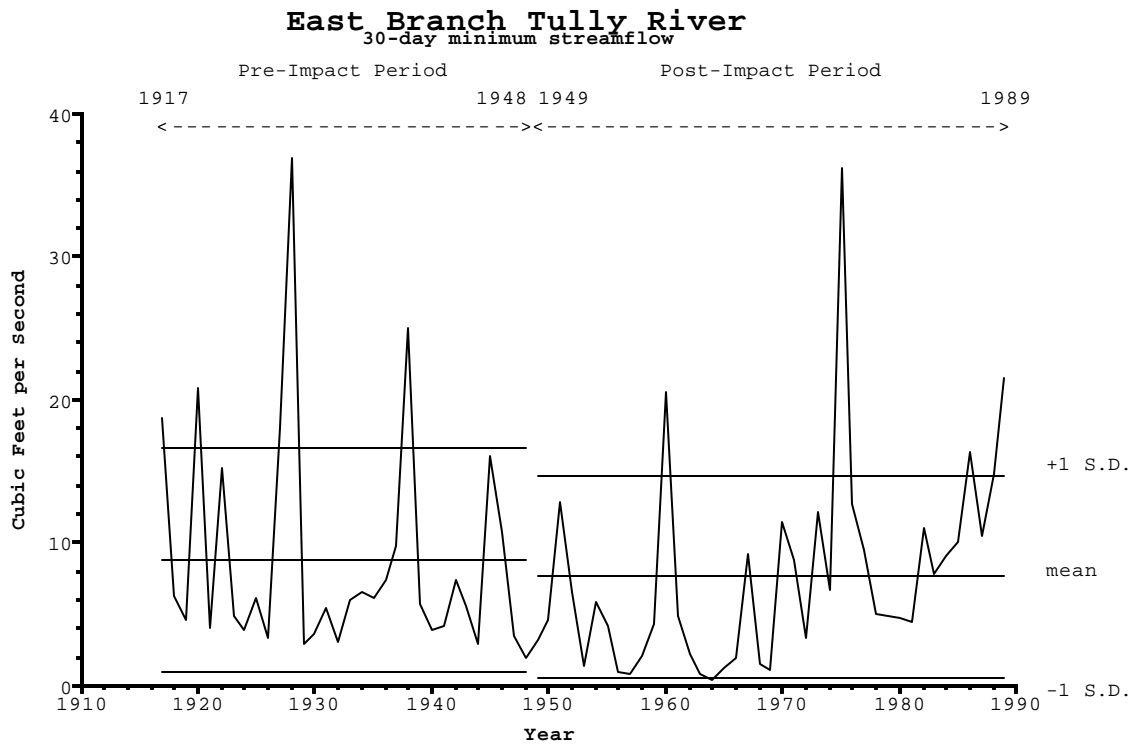


Figure 8.5.1.1-16

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

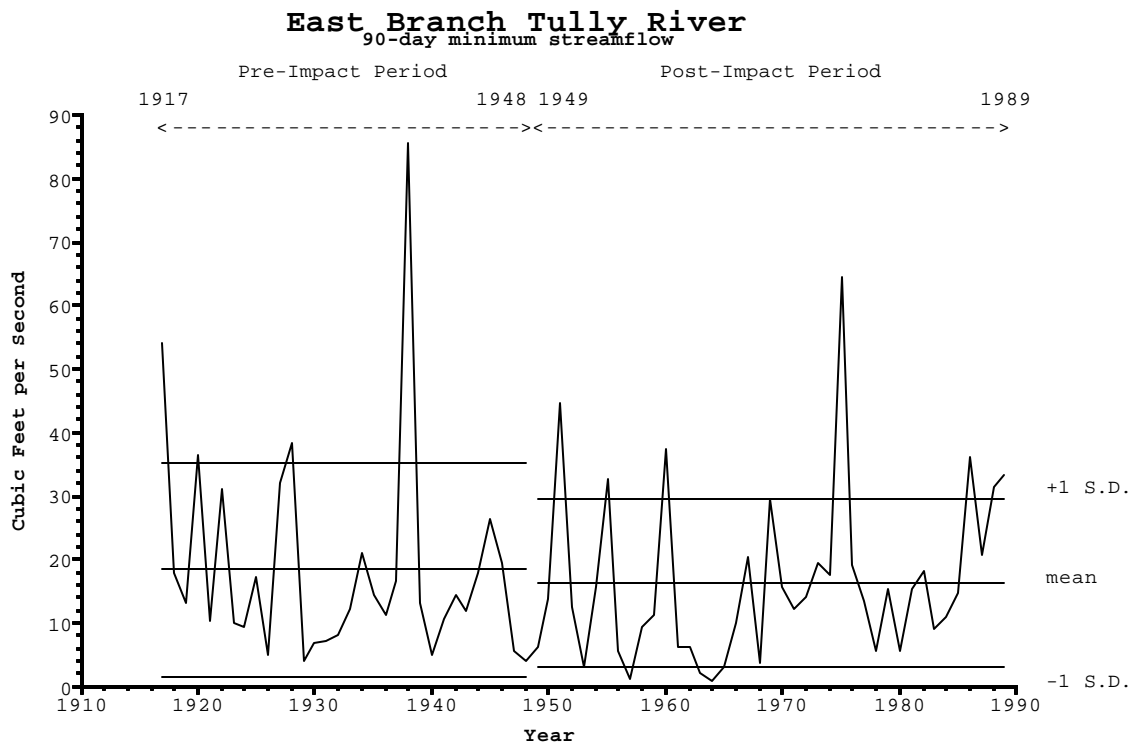


Figure 8.5.1.1-17

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

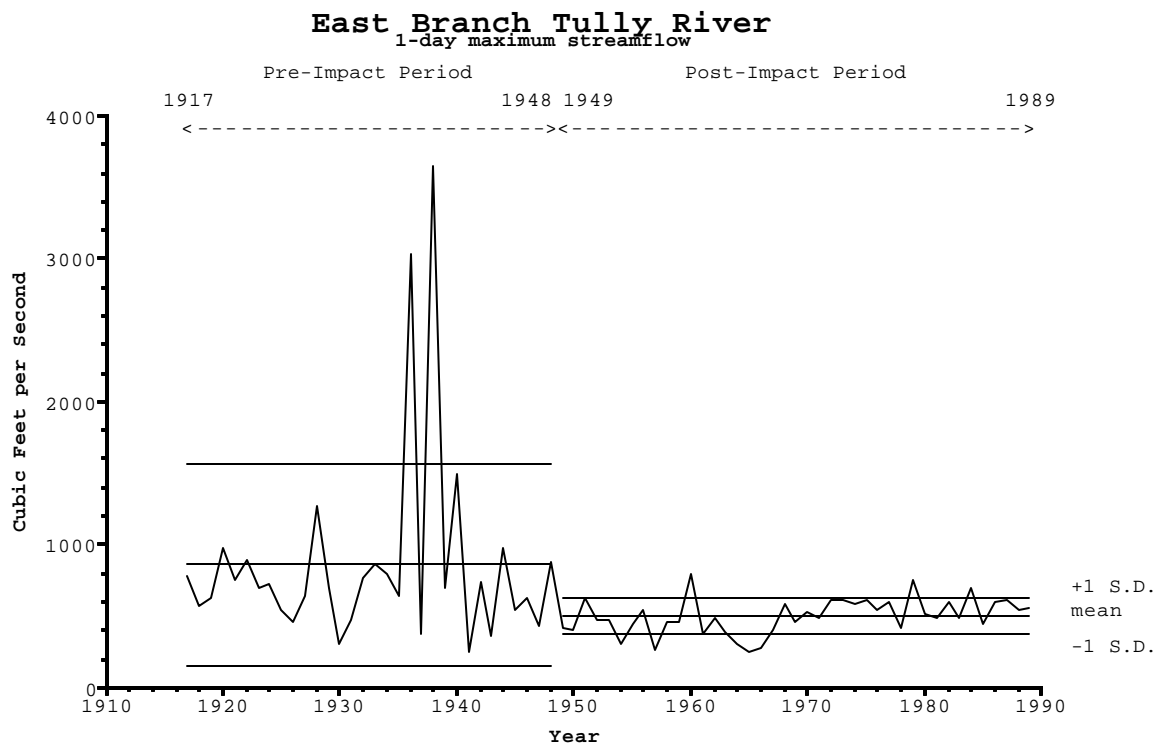


Figure 8.5.1.1-18

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

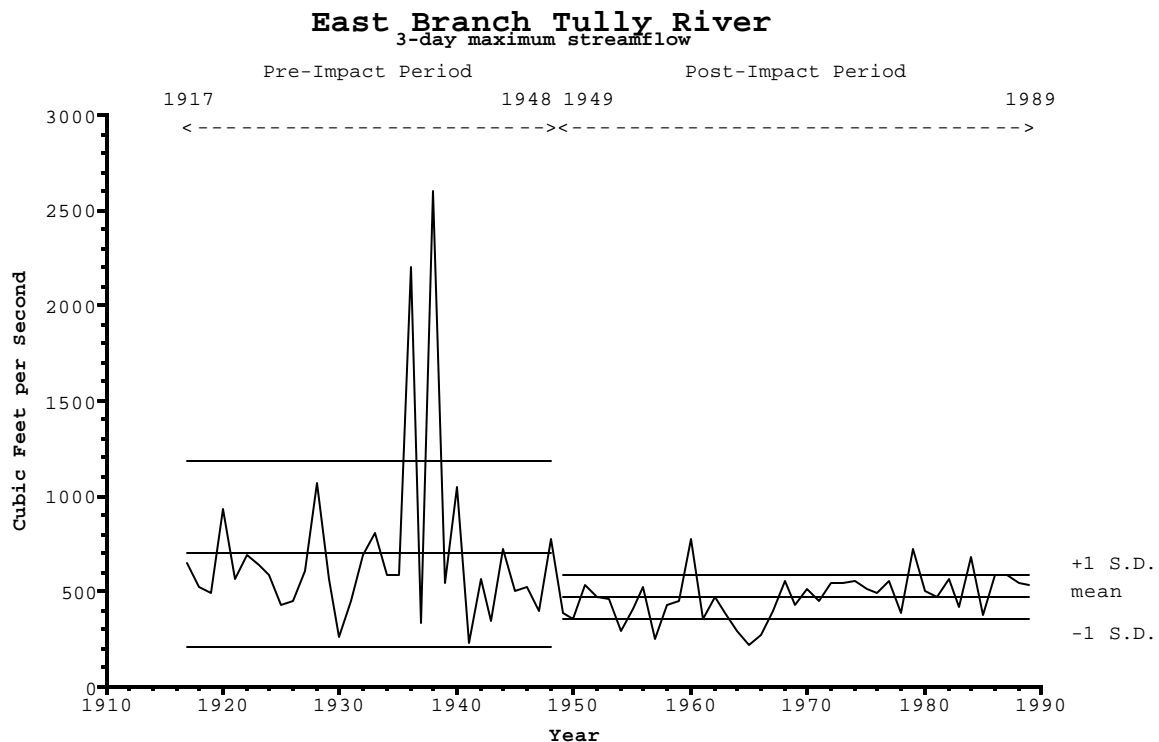


Figure 8.5.1.1-19

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

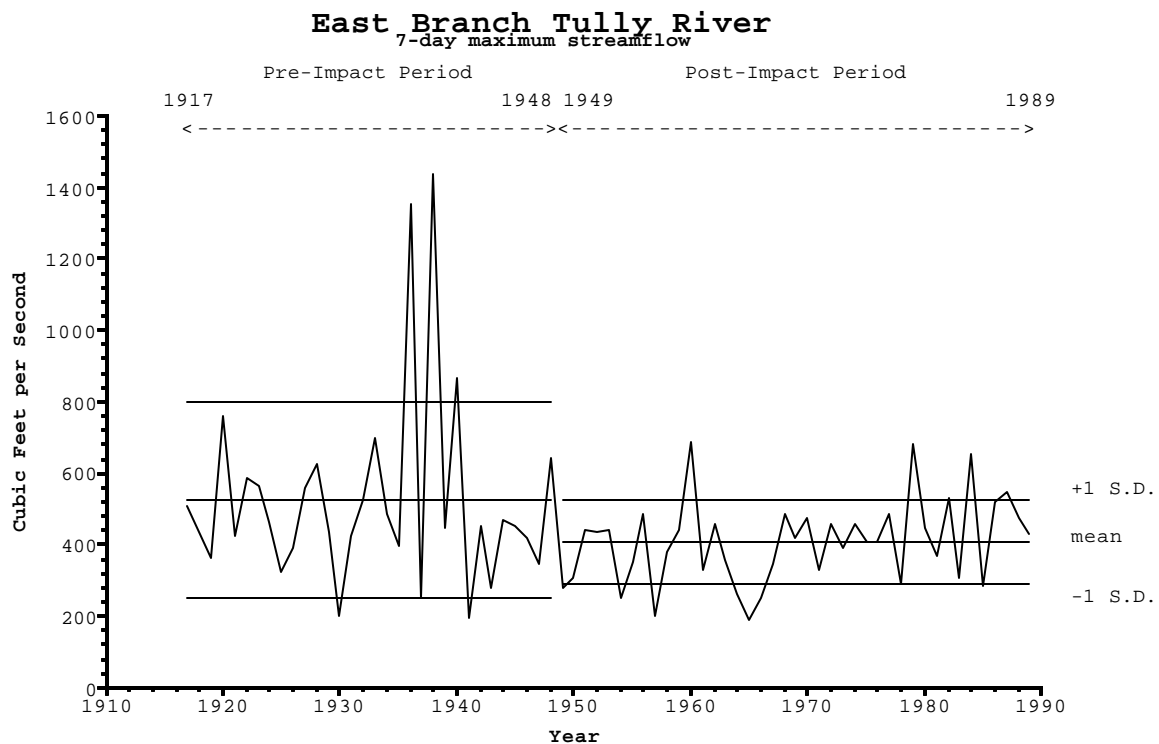


Figure 8.5.1.1-20

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

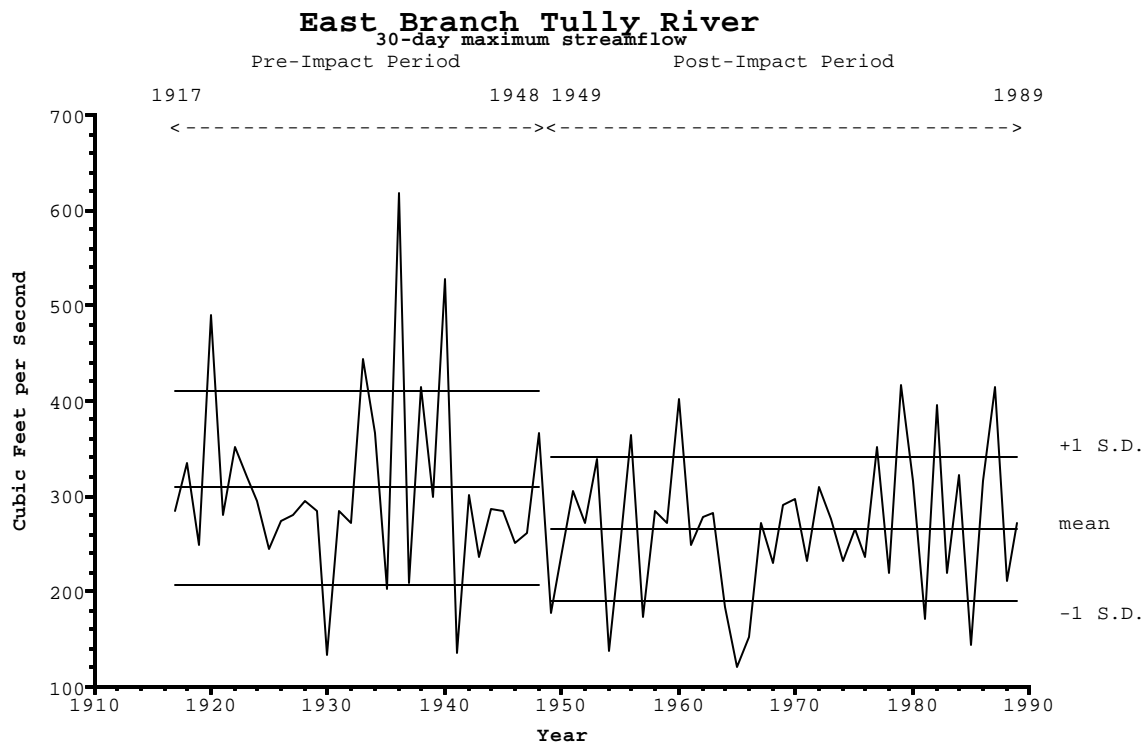


Figure 8.5.1.1-21

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

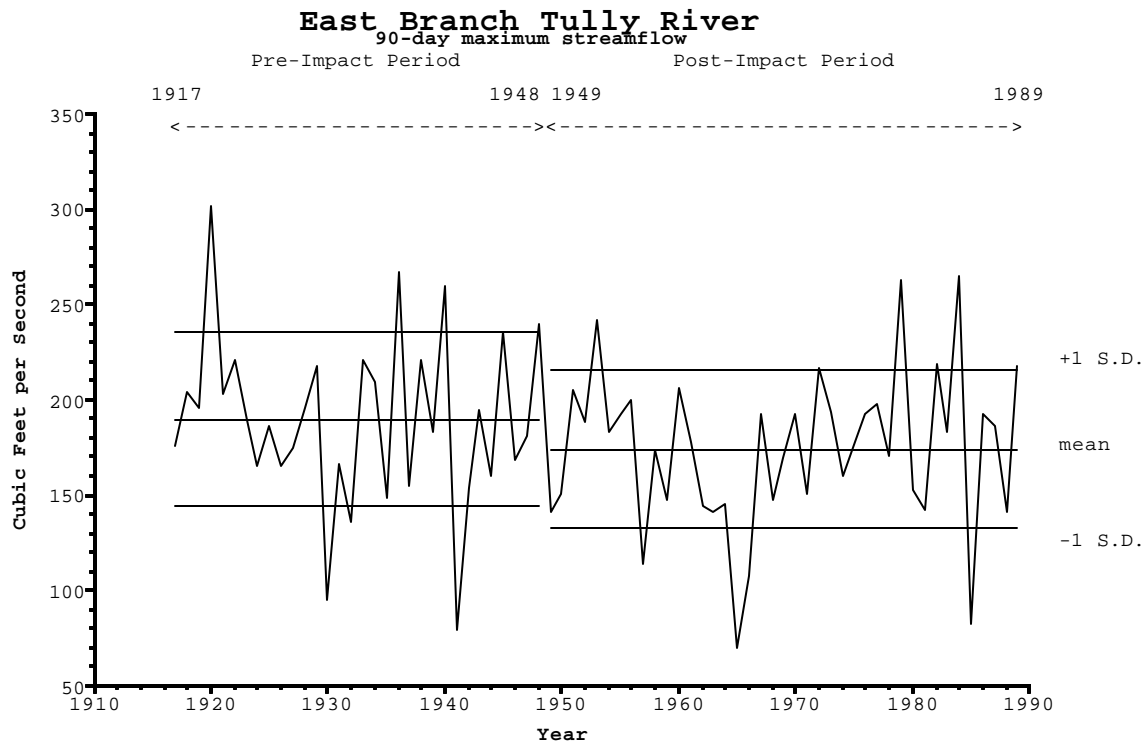


Figure 8.5.1.1-22

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

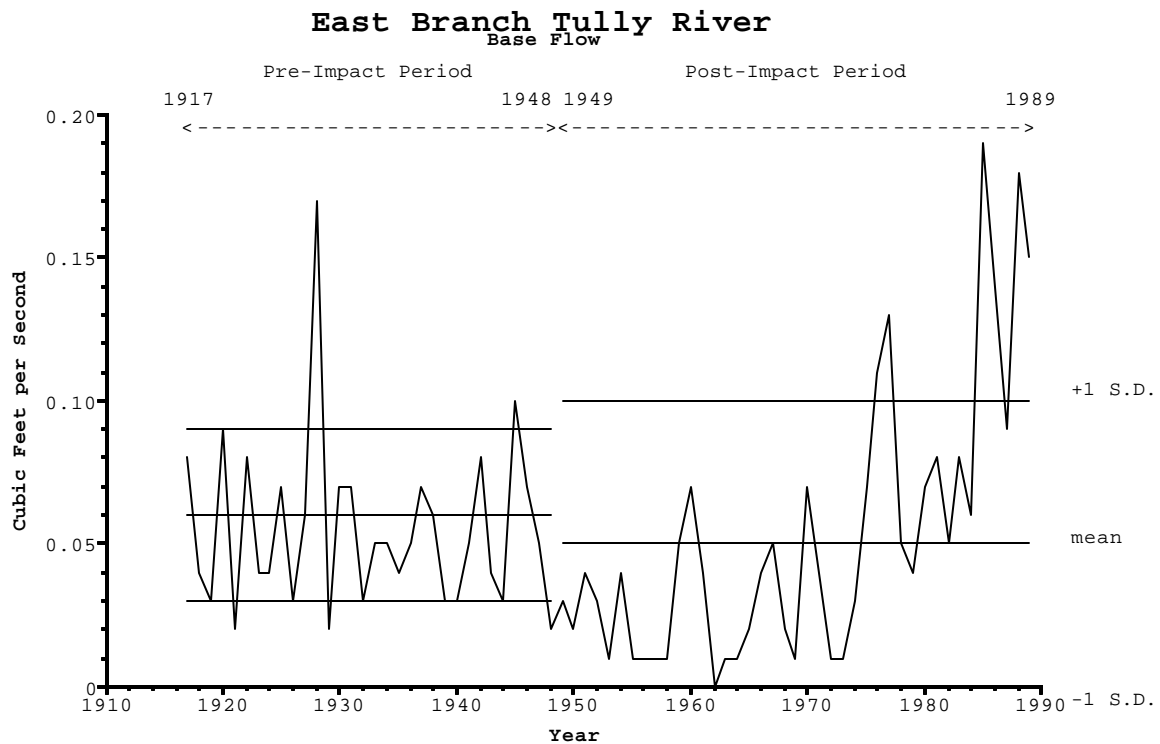


Figure 8.5.1.1-23

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

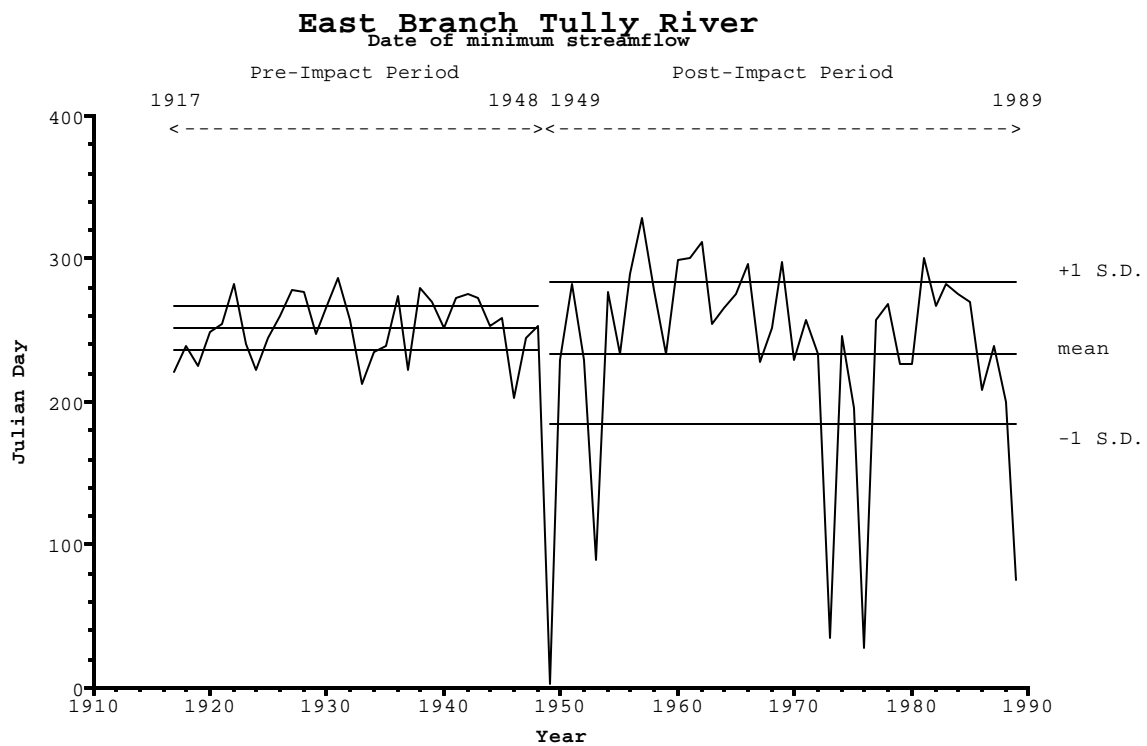


Figure 8.5.1.1-24

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

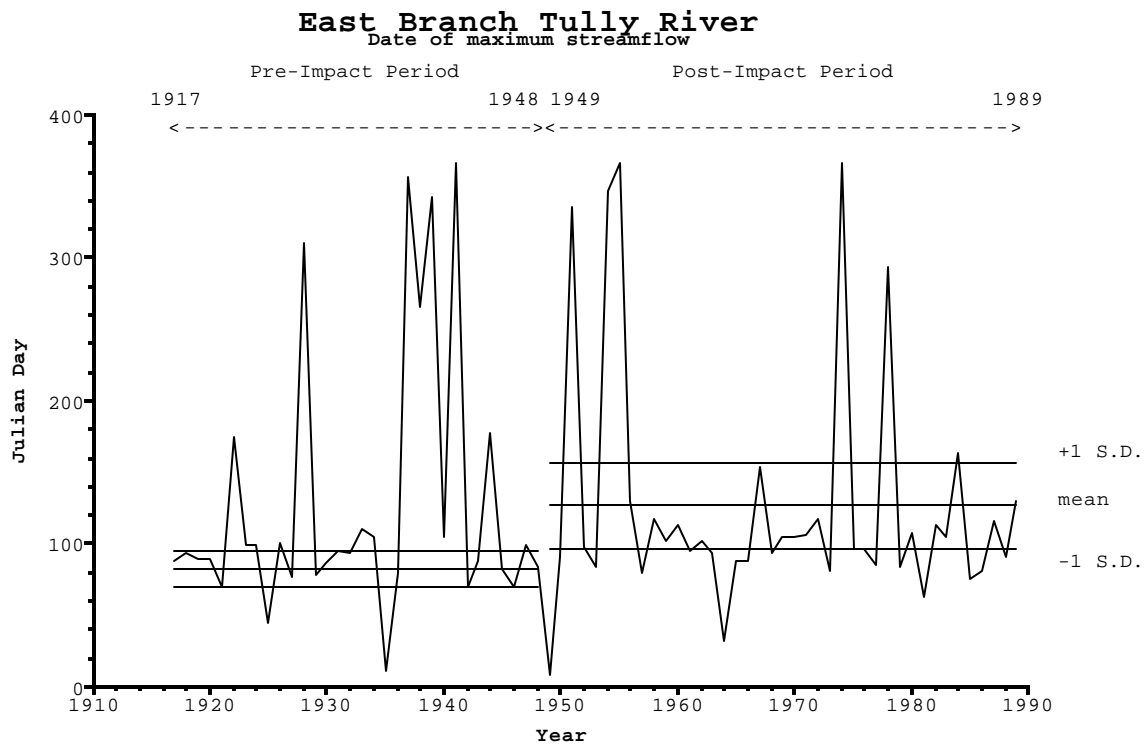


Figure 8.5.1.1-25

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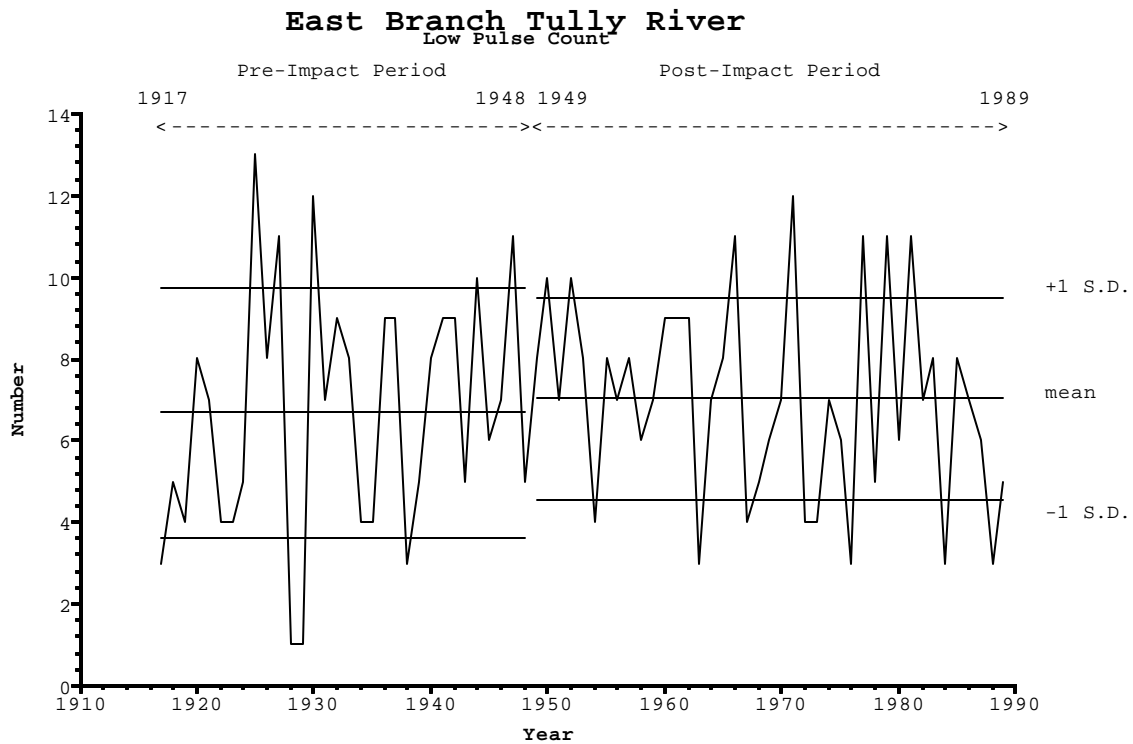


Figure 8.5.1.1-26

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw



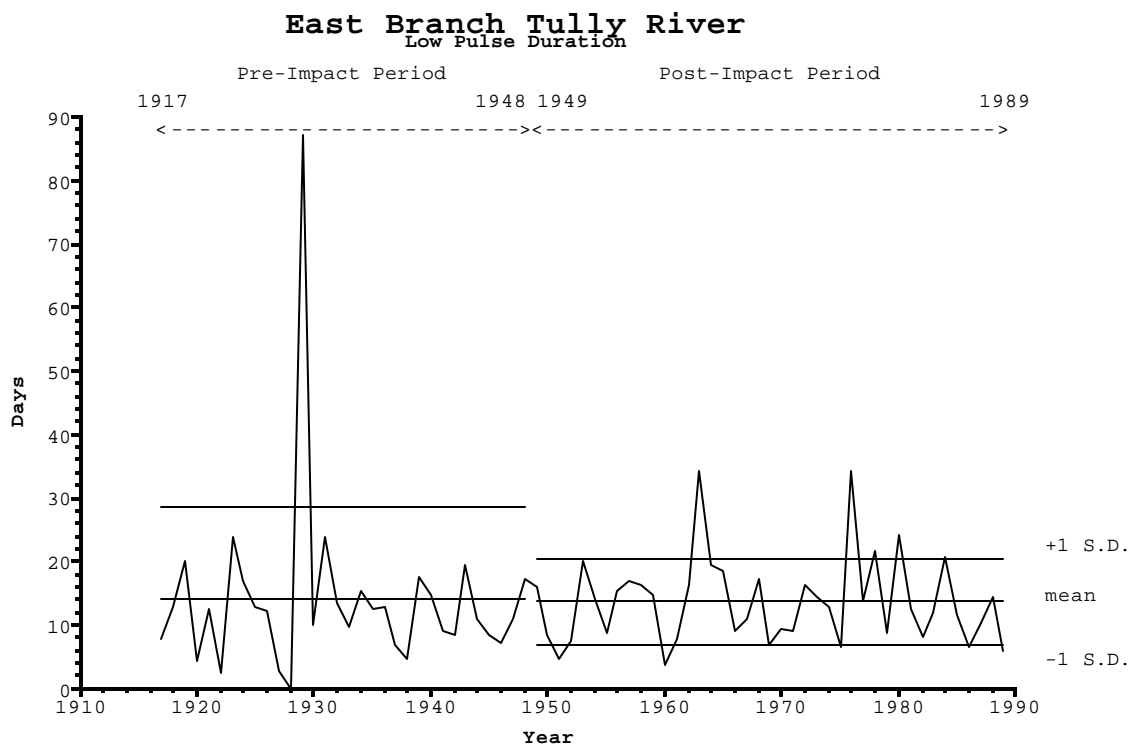


Figure 8.5.1.1-27

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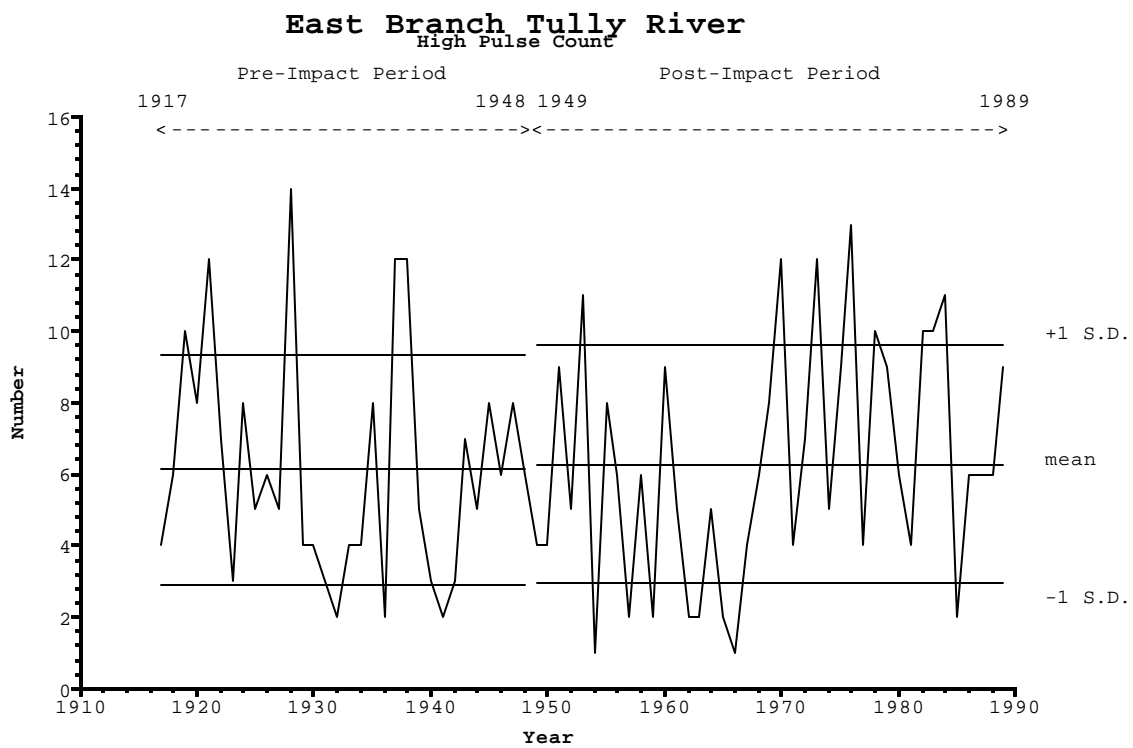


Figure 8.5.1.1-28

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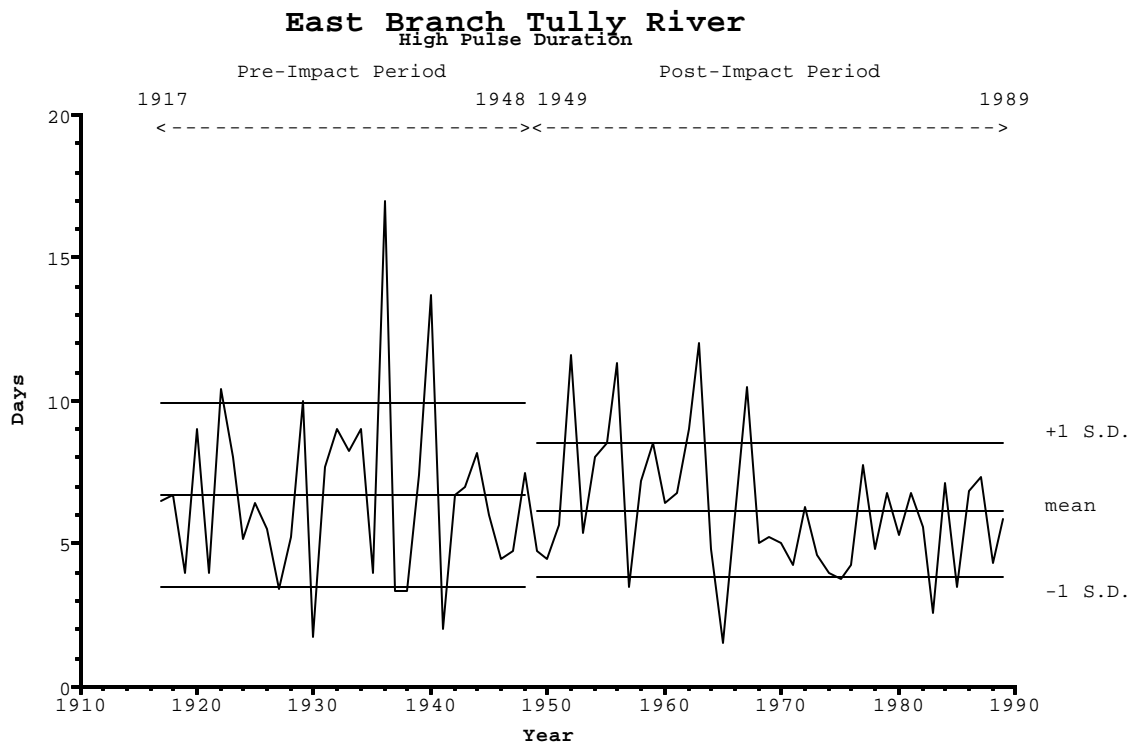


Figure 8.5.1.1-29

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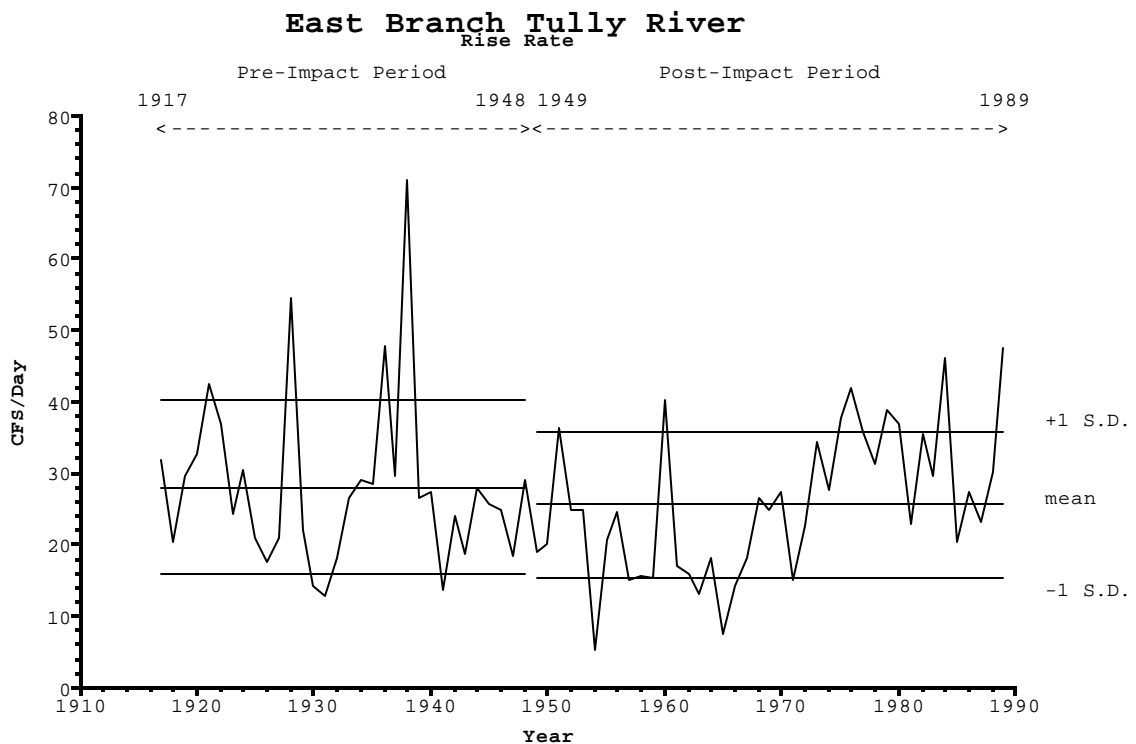


Figure 8.5.1.1-30

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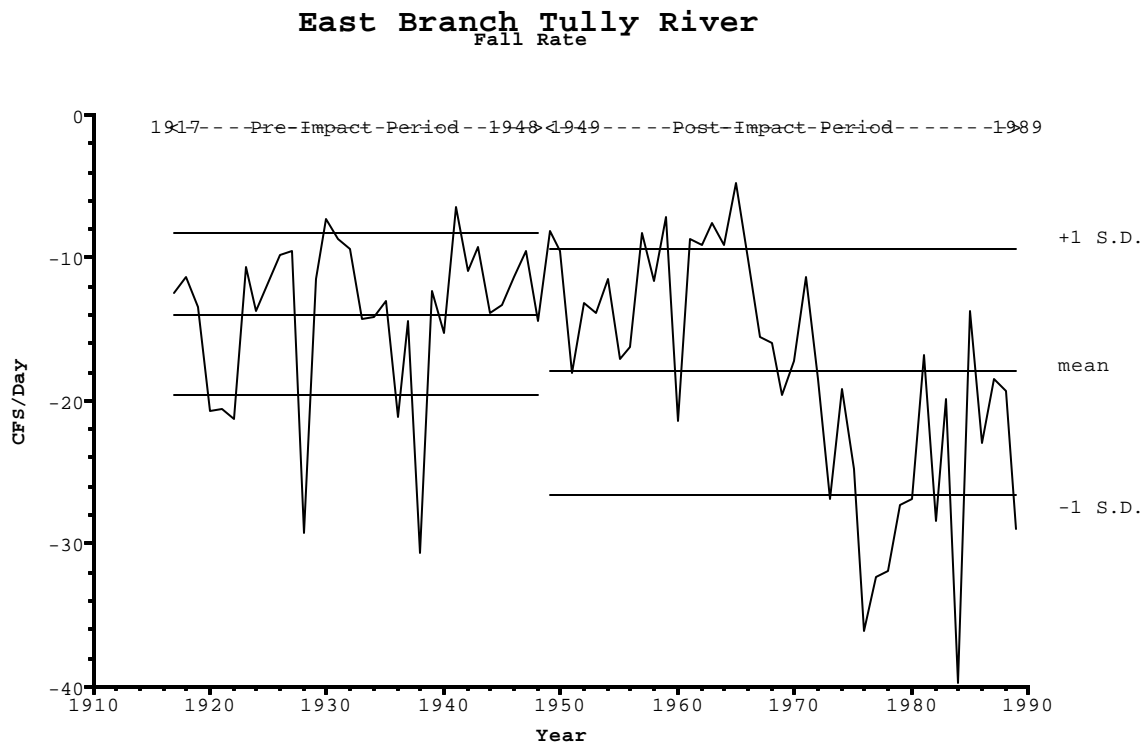


Figure 8.5.1.1-31

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

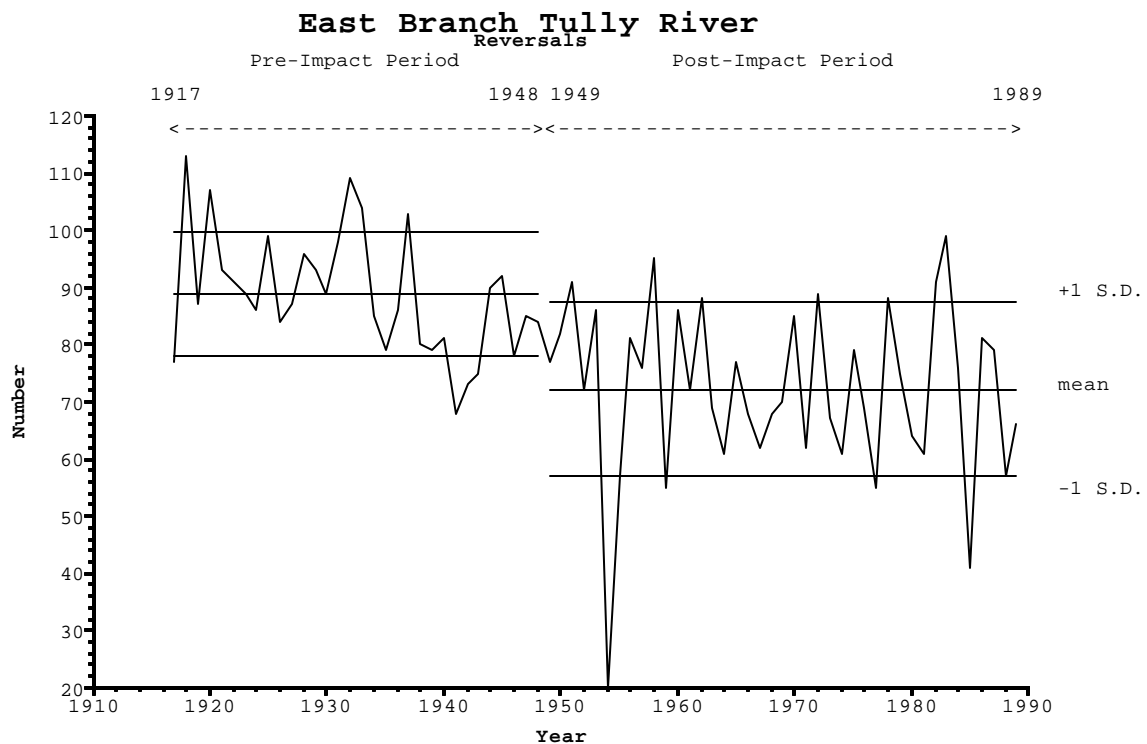


Figure 8.5.1.1-32

File(s) Used: C:\IHA\tully.ann, C:\IHA\tully.baw

# IHA Parametric Scorecard Millers River at Erving, MA

**TABLE 8.5.1.2-1**

	<i>Pre-impact period: 1916-1940 (25 years)</i>	<i>Post-impact period: 1949-2000 (52 years)</i>
Watershed Area (sq mi)	372	372
Mean Annual Flow (cfs)	625.11	644.63
Mean Flow/Area (cfs/sq mi)	1.68	1.73

	Mean		Coefficient of Variance		Deviation Factor		Deviation of Coefficient of Variance	
	Pre	Post	Pre	Post	Magnitude	%	Magnitude	%
<b>Parameter Group #1</b>								
October (cfs)	292.9	401.5	0.56	0.9	108.7	37.1	0.33	59.1
November (cfs)	472.8	572.7	0.67	0.64	99.9	21.1	-0.02	-3.3
December (cfs)	639	693.3	0.61	0.61	54.3	8.5	0	0.4
January (cfs)	619.8	656.9	0.56	0.54	37.1	6	-0.02	-3.4
February (cfs)	509.5	692.1	0.45	0.59	182.6	35.8	0.14	31.7
March (cfs)	1231.5	1118.9	0.58	0.42	-112.6	-9.1	-0.16	-27.6
April (cfs)	1687.9	1589.3	0.42	0.39	-98.6	-5.8	-0.02	-5.7
May (cfs)	812.2	825.6	0.36	0.44	13.4	1.7	0.08	20.9
June (cfs)	544	497	0.62	0.75	-47	-8.6	0.13	20.3
July (cfs)	351	251	0.78	0.64	-100	-28.5	-0.13	-16.9
August (cfs)	265.7	222.5	0.86	0.83	-43.2	-16.3	-0.03	-3.5
September (cfs)	379.1	233.5	1.55	0.92	-145.5	-38.4	-0.63	-40.7
Mean  %  change					18.1		19.5	
<b>Parameter Group #2</b>								
1-day minimum (cfs)	30.9	53.4	0.64	0.44	22.5	72.8	-0.21	-32.1
3-day minimum (cfs)	67.7	63.3	0.55	0.35	-4.3	-6.4	-0.2	-35.7
7-day minimum (cfs)	97.3	73	0.51	0.32	-24.4	-25	-0.19	-37.5
30-day minimum (cfs)	138.5	103.9	0.6	0.51	-34.6	-25	-0.08	-14.2
90-day minimum (cfs)	215.2	173.6	0.64	0.53	-41.6	-19.4	-0.11	-17.4
1-day maximum (cfs)	5372.8	3396	0.87	0.28	-1976.8	-36.8	-0.59	-67.5
3-day maximum (cfs)	4695.6	3072.5	0.78	0.25	-1623.1	-34.6	-0.54	-68.3
7-day maximum (cfs)	3653.3	2739.6	0.63	0.24	-913.7	-25	-0.39	-62.3
30-day maximum (cfs)	2152.1	1953.4	0.4	0.29	-198.7	-9.2	-0.11	-27.3
90-day maximum (cfs)	1364.5	1296	0.24	0.25	-68.4	-5	0	1.2
Base flow (cfs)	0.15	0.12	0.37	0.34	-0.03	-19.34	-0.04	-9.48
Mean  %  change					25.3		33.9	
<b>Parameter Group #3</b>								
Date of minimum (julian date)	265.9	240.3	0.09	0.12	25.6	14	0.03	30.6
Date of maximum (julian date)	131.7	133.5	0.24	0.25	1.8	1	0.01	3
Mean  %  change					7.5		16.8	
<b>Parameter Group #4</b>								
Low pulse count (#)	16.9	7.8	0.47	0.45	-9.2	-54.2	-0.02	-4.3
Low pulse duration (days)	5.5	14.1	0.9	0.6	8.6	156.9	-0.3	-33.1
High pulse count (#)	5.7	5.8	0.61	0.49	0.2	2.9	-0.12	-19.3
High pulse duration (days)	8.5	7.6	0.92	0.56	-0.9	-10.4	-0.36	-39
Mean  %  change					56.1		23.9	
<b>Parameter Group #5</b>								
Rise rate (cfs/day)	154	136.2	0.36	0.35	-17.8	-11.6	-0.01	-3.9
Fall rate (cfs/day)	-115	-75.3	-0.32	-0.31	39.7	-34.5	0.01	-2.7
Number of reversals (#)	161.4	116.2	0.12	0.1	-45.2	-28	-0.01	-11.5
Mean  %  change					24.7		6	

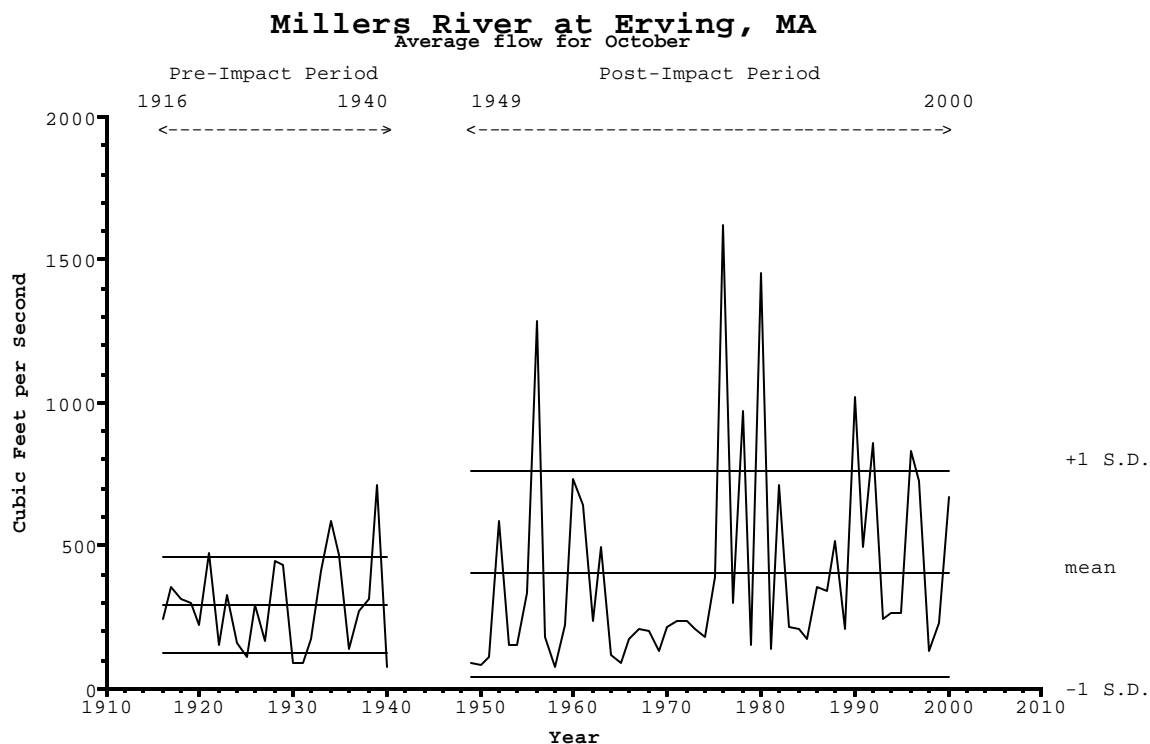


Figure 8.5.1.2-1

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

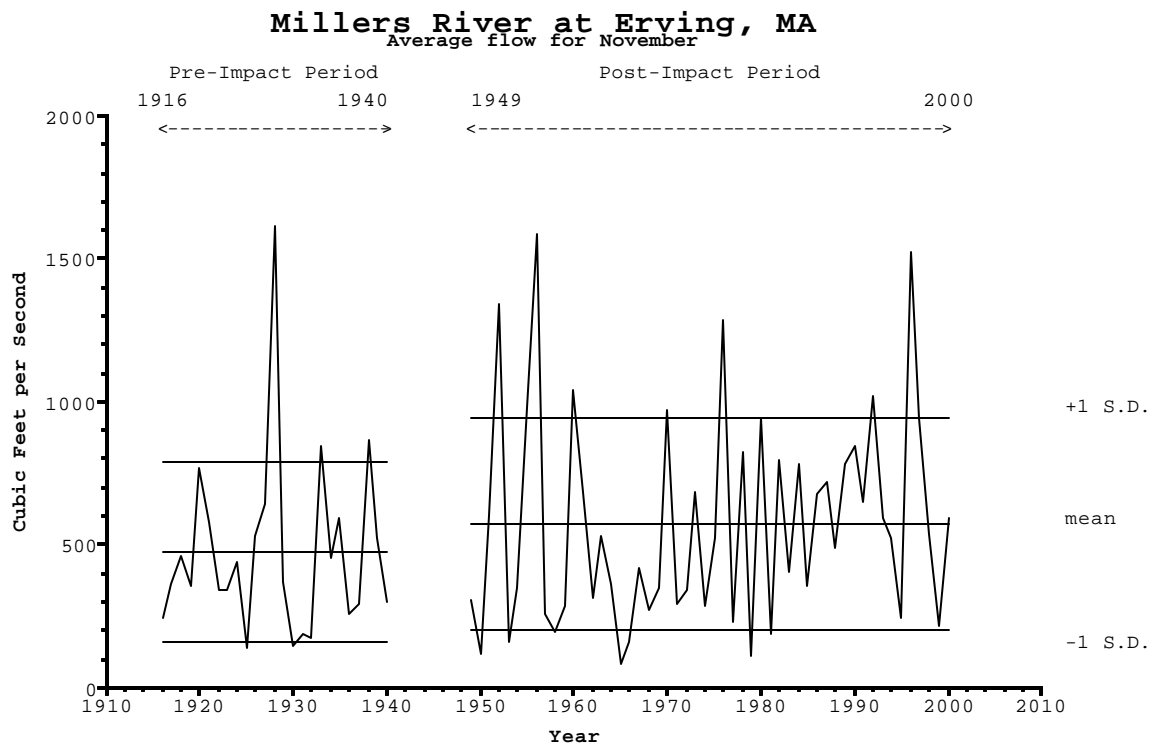


Figure 8.5.1.2-2

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

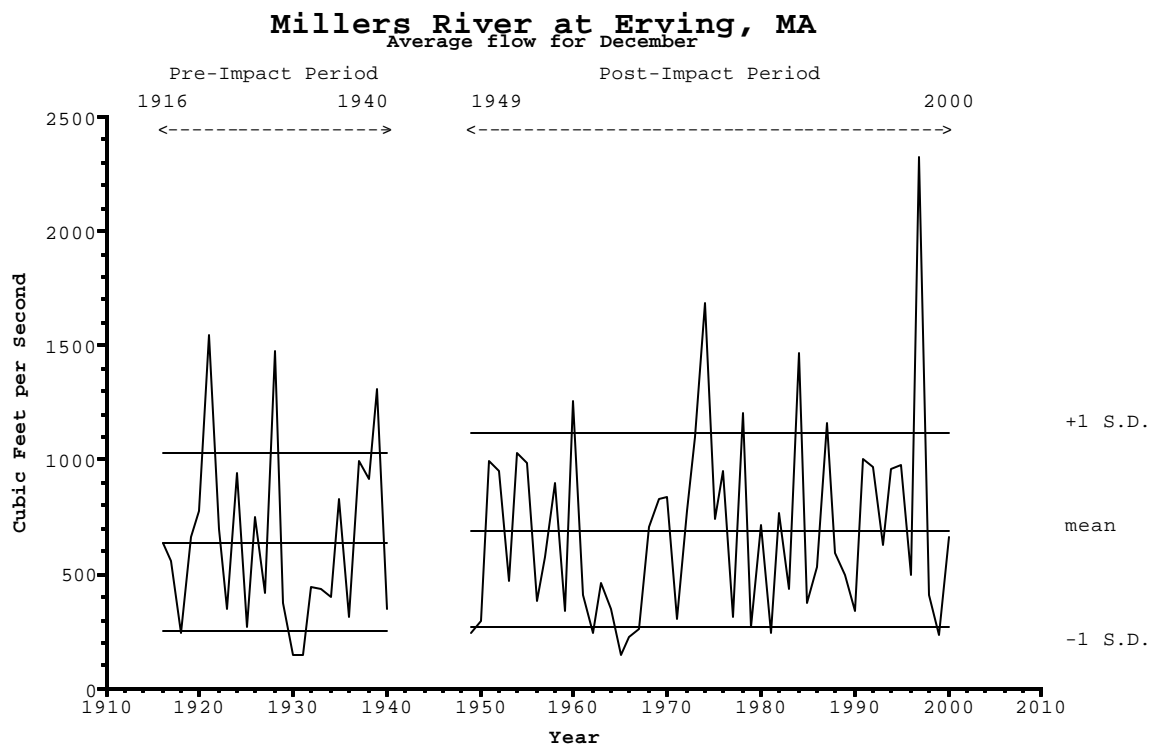


Figure 8.5.1.2-3

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

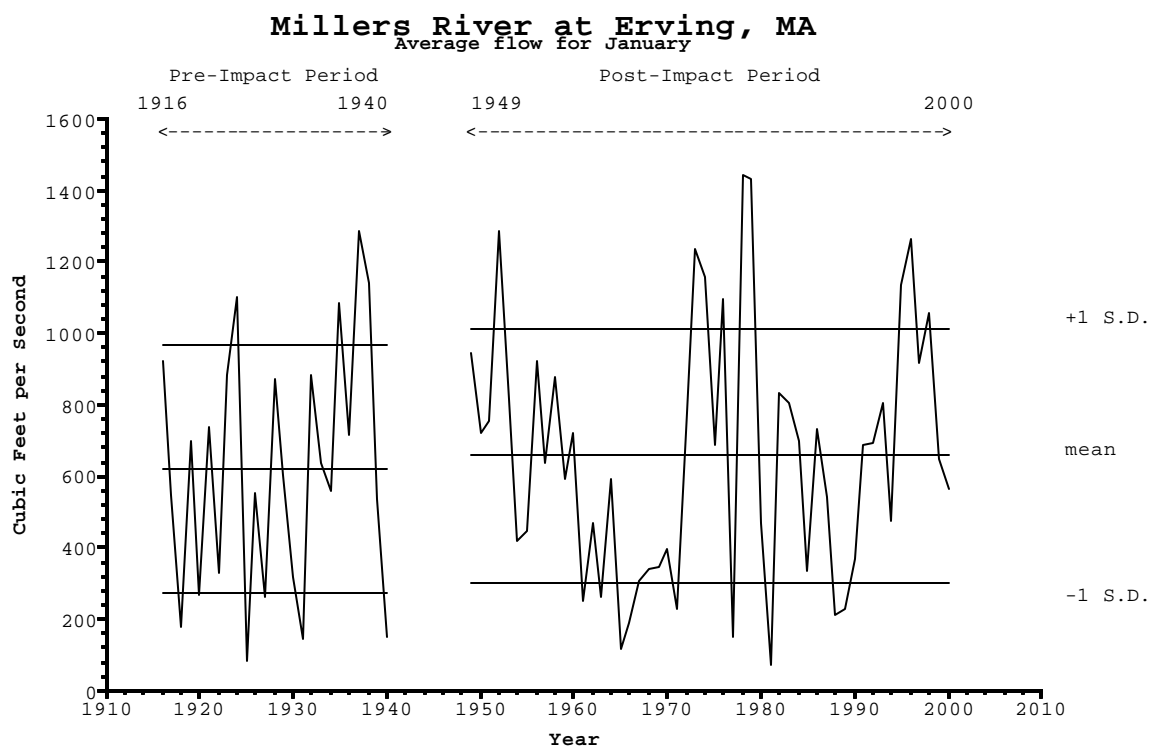


Figure 8.5.1.2-4

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

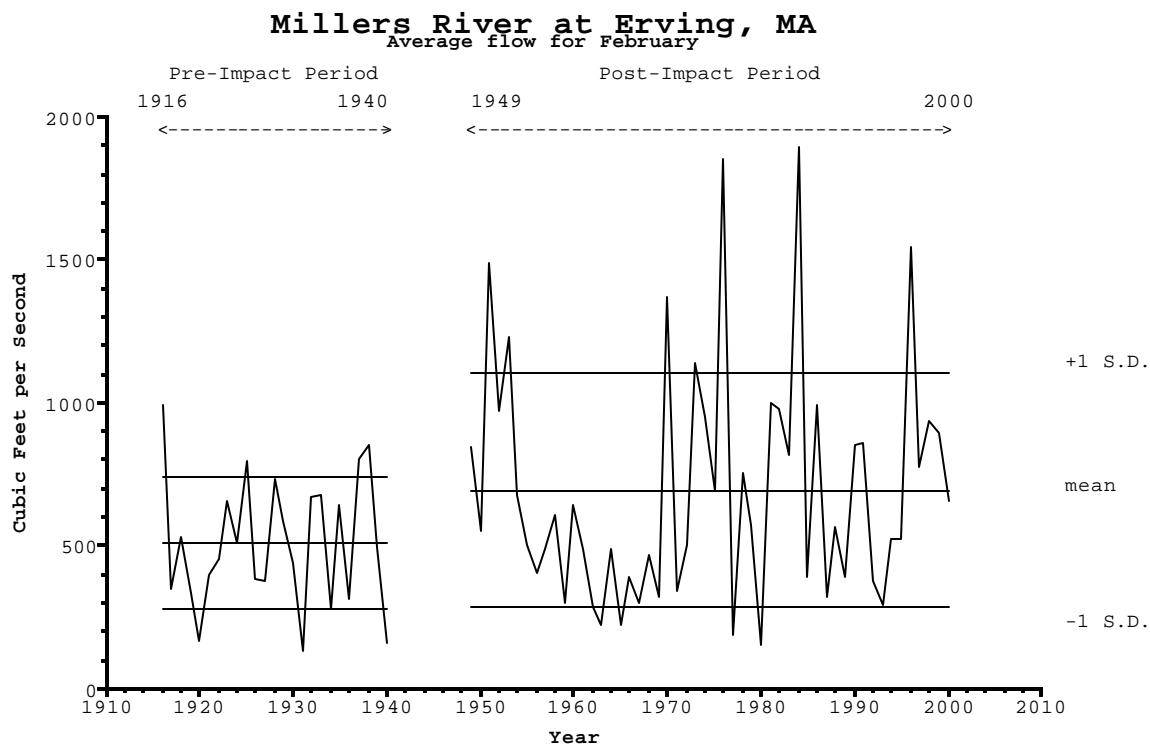


Figure 8.5.1.2-5

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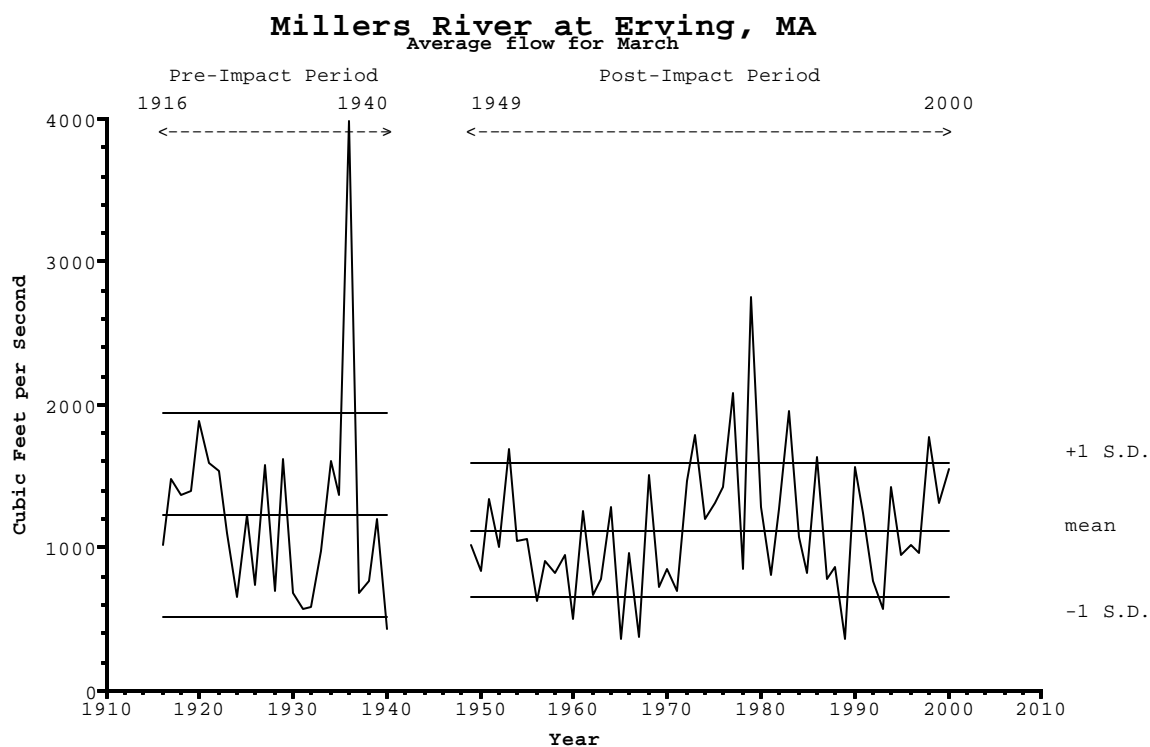


Figure 8.5.1.2-6

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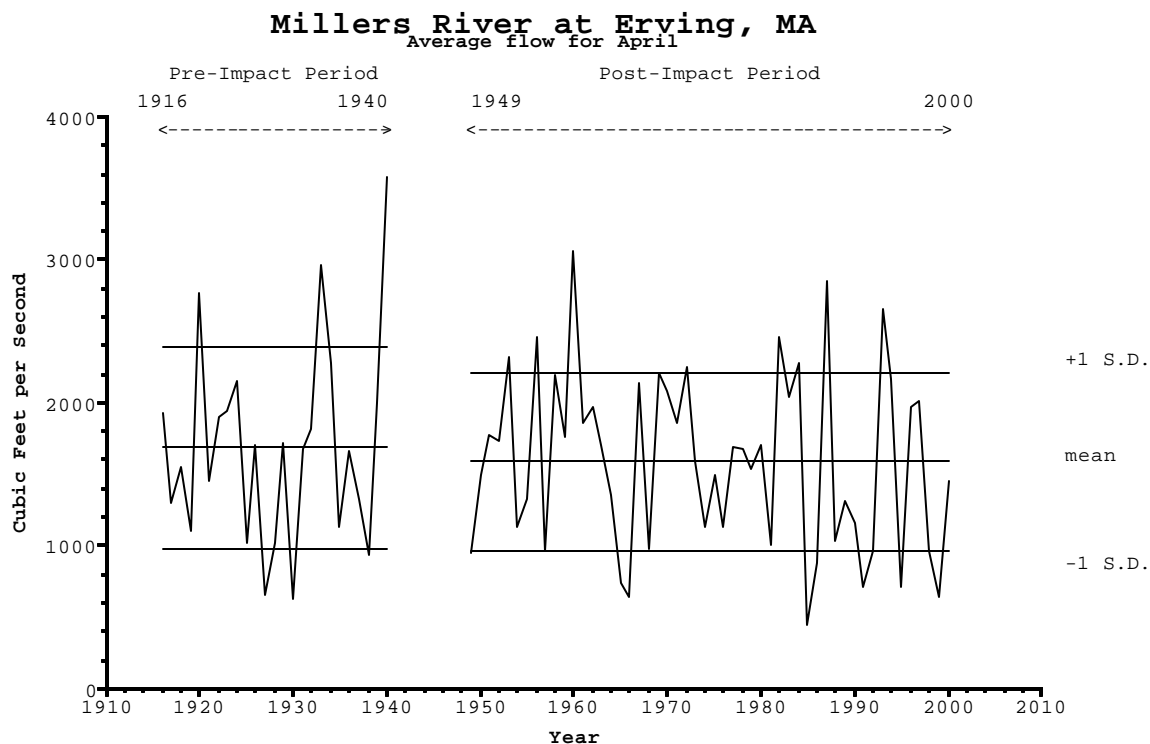


Figure 8.5.1.2-7

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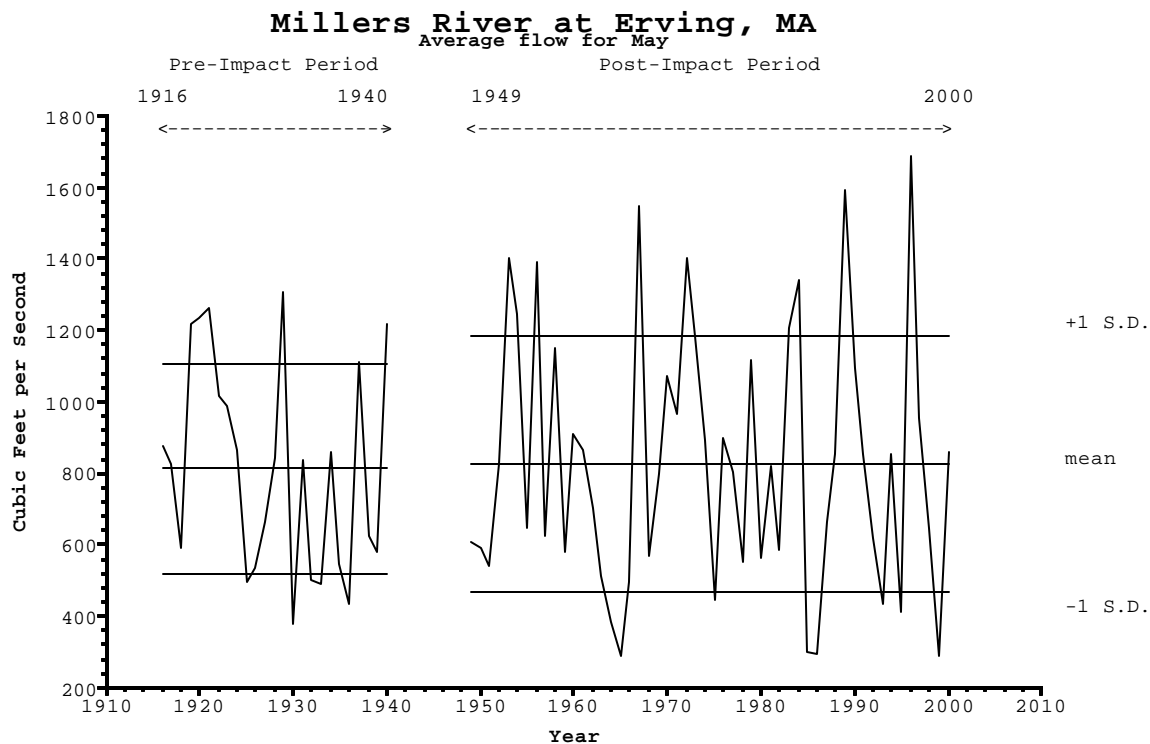


Figure 8.5.1.2-8

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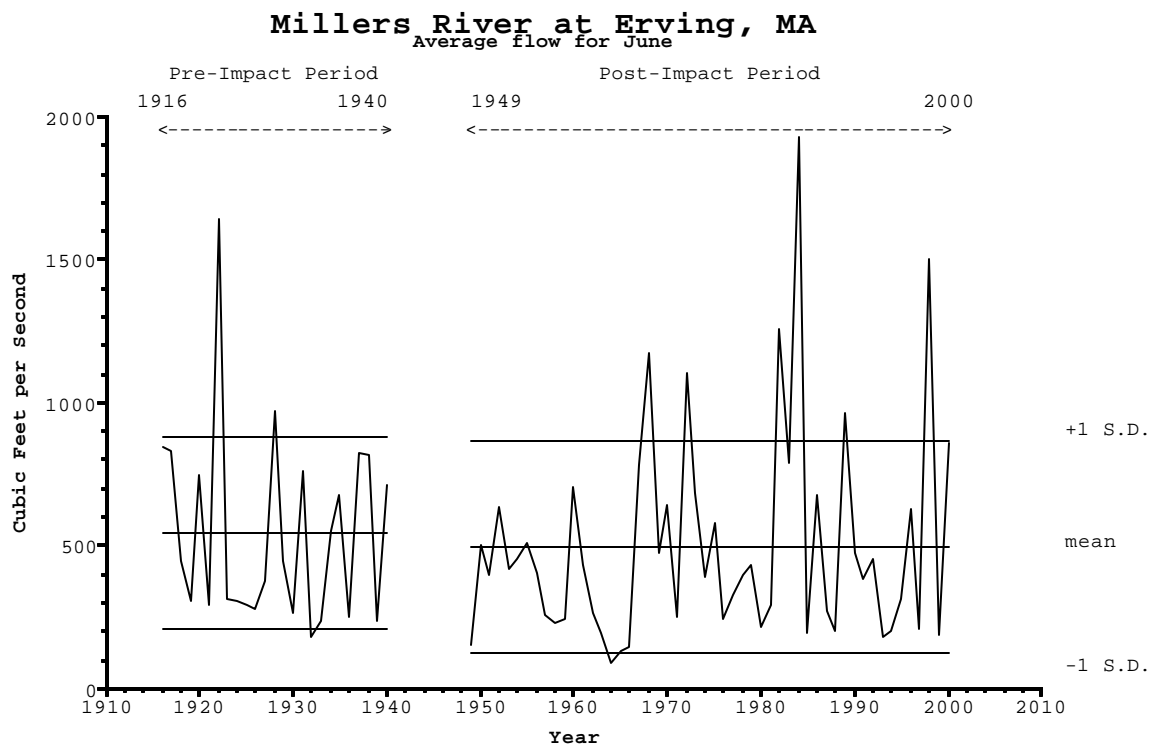


Figure 8.5.1.2-9

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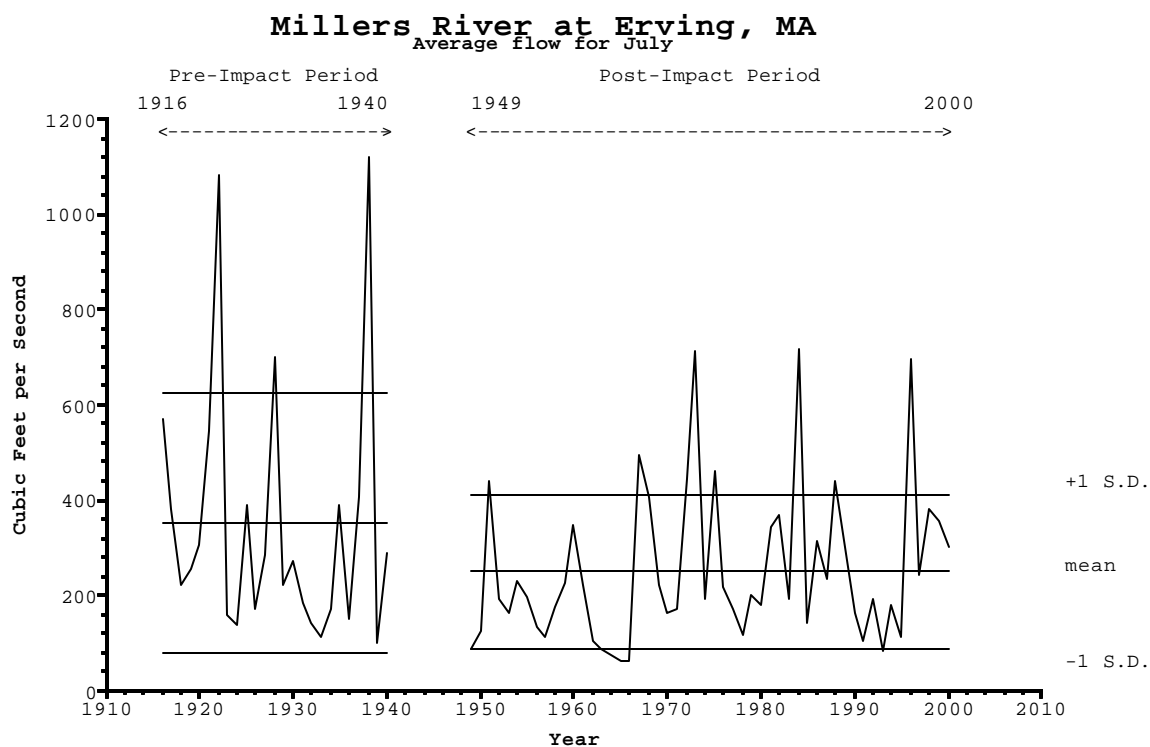


Figure 8.5.1.2-10

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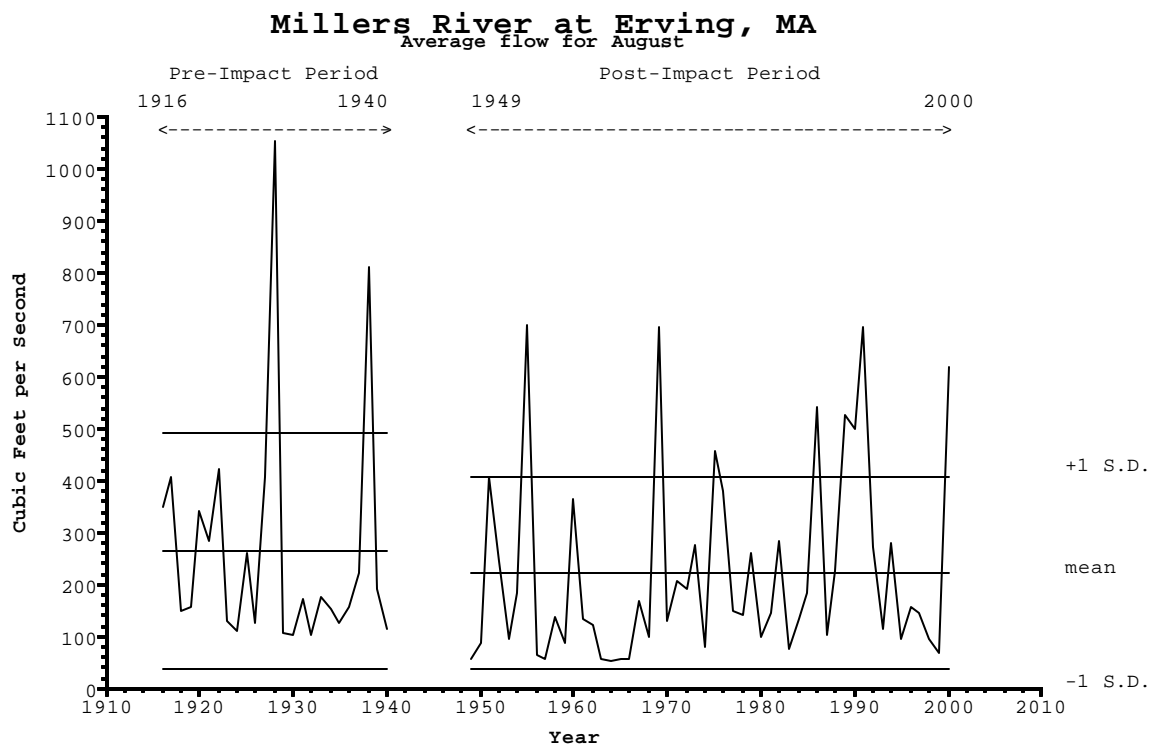


Figure 8.5.1.2-11

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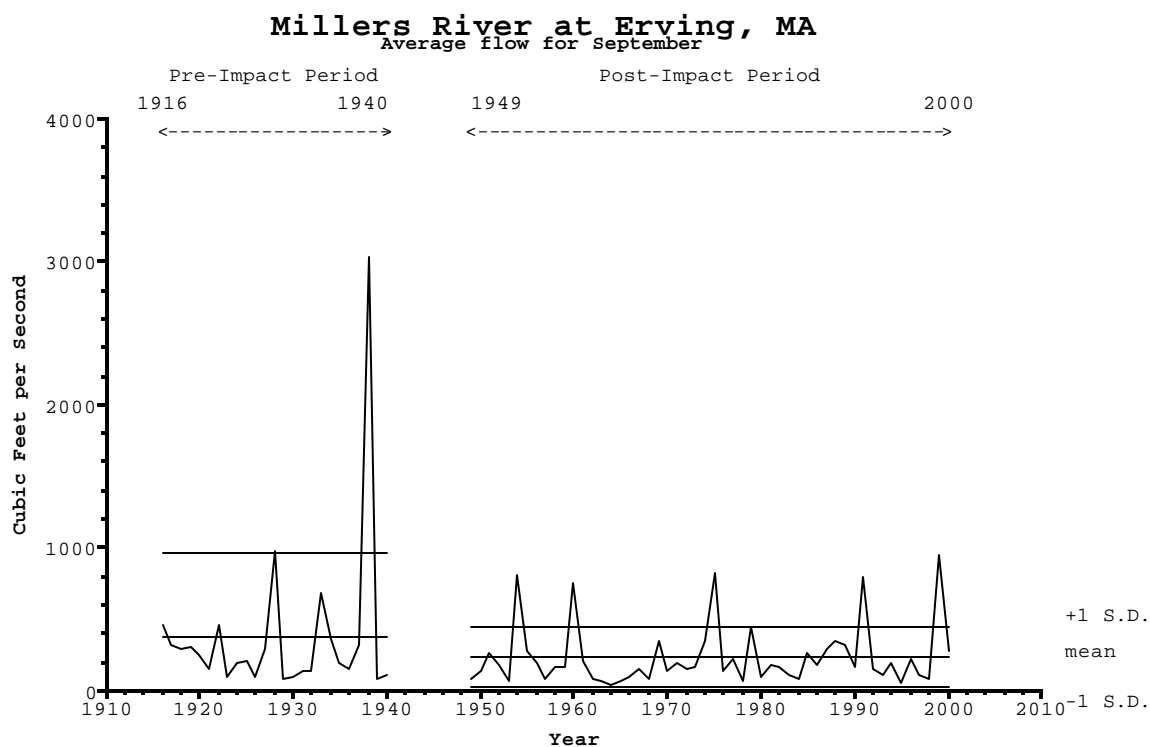


Figure 8.5.1.2-12

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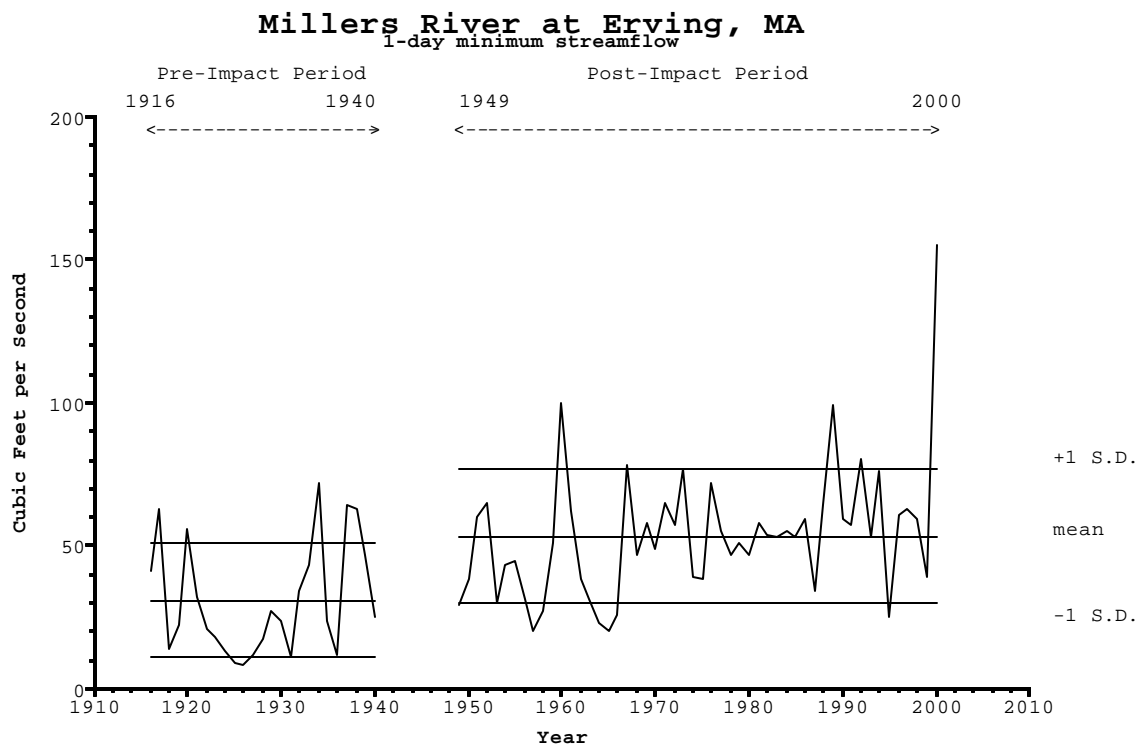


Figure 8.5.1.2-13

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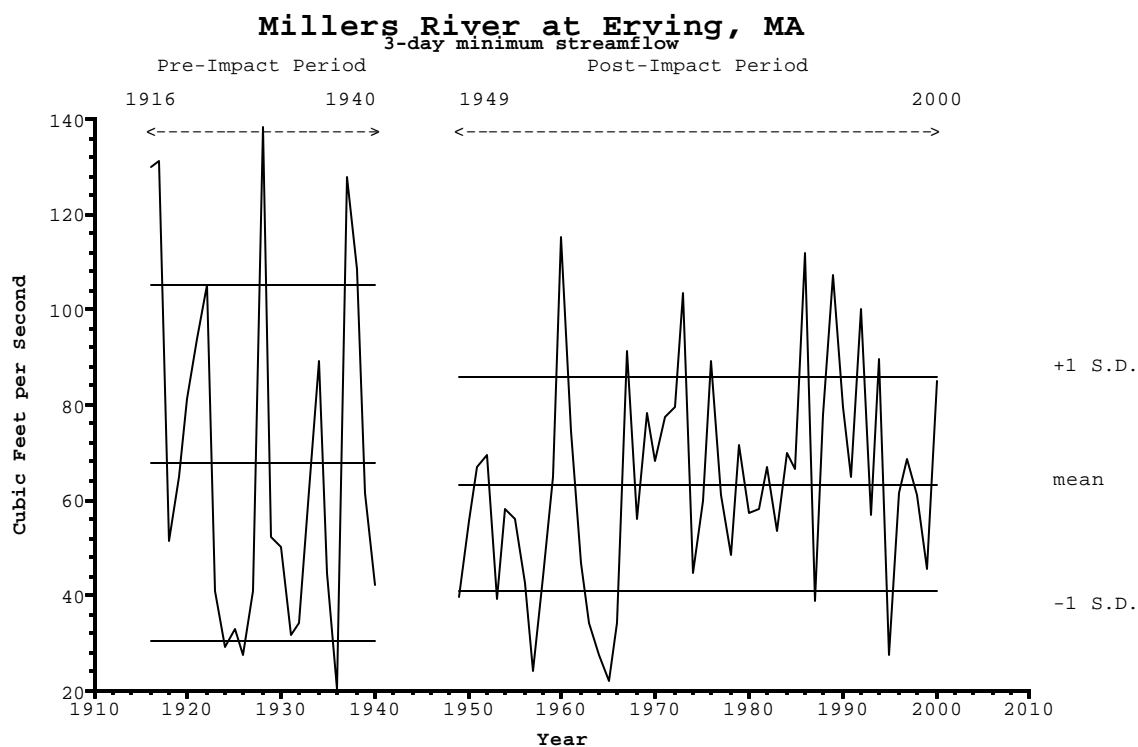


Figure 8.5.1.2-14

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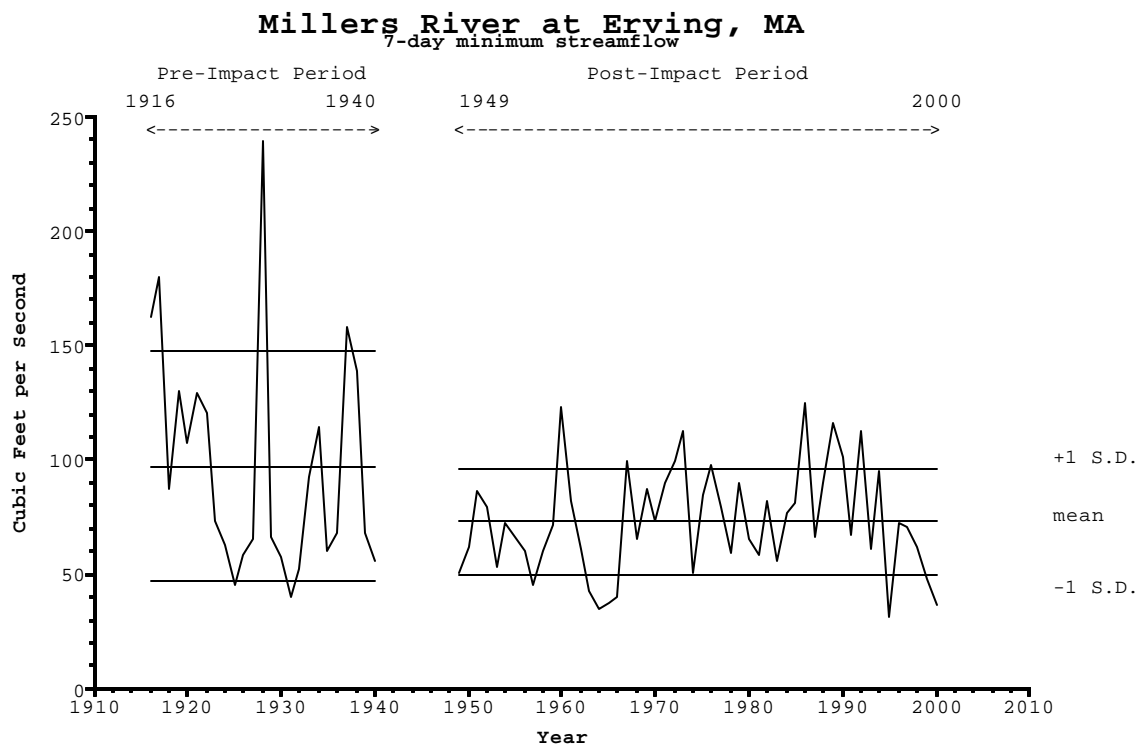


Figure 8.5.1.2-15

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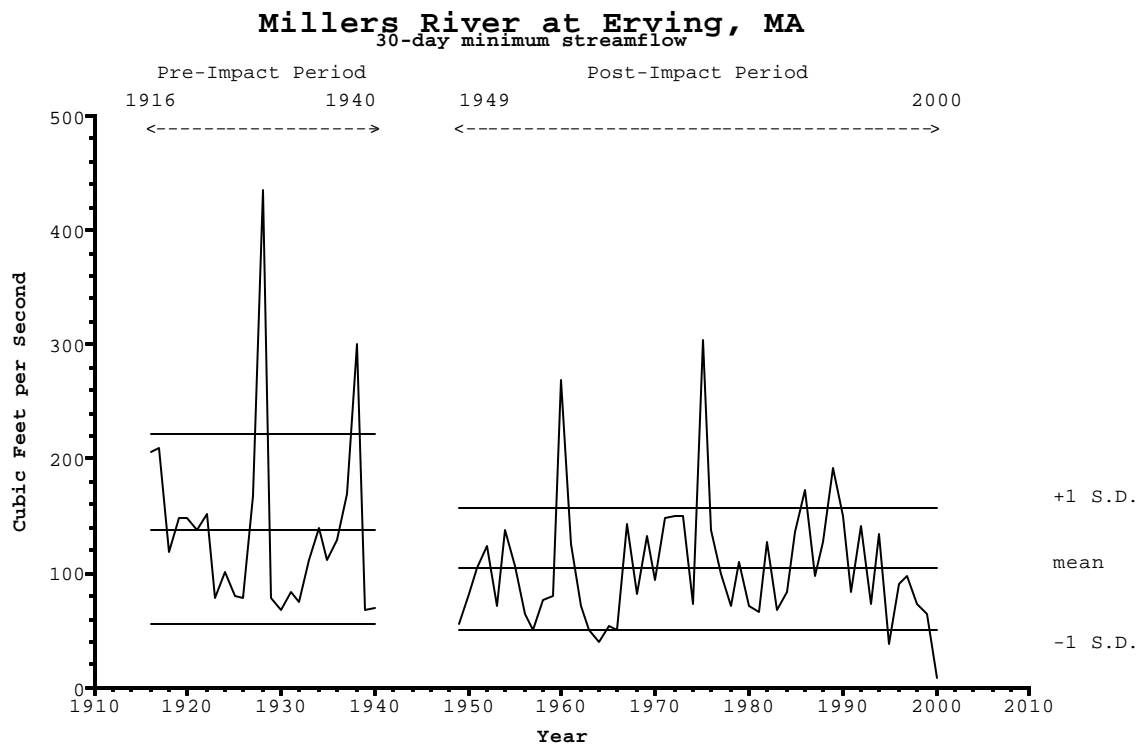


Figure 8.5.1.2-16

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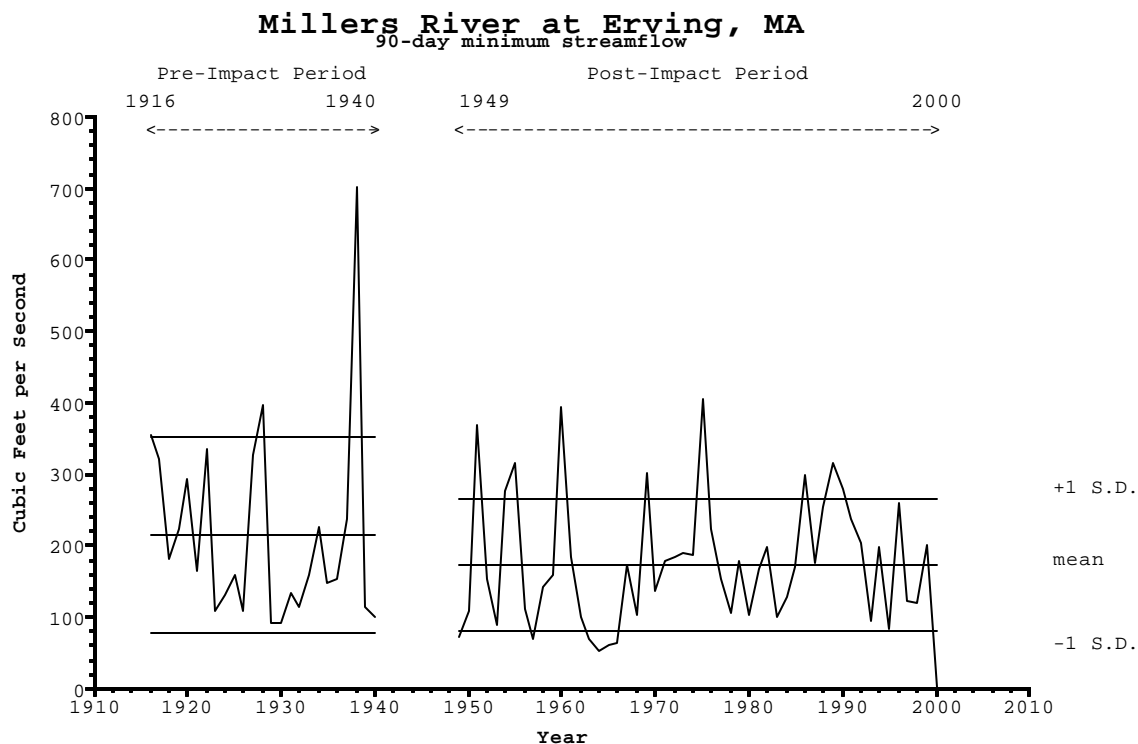


Figure 8.5.1.2-17

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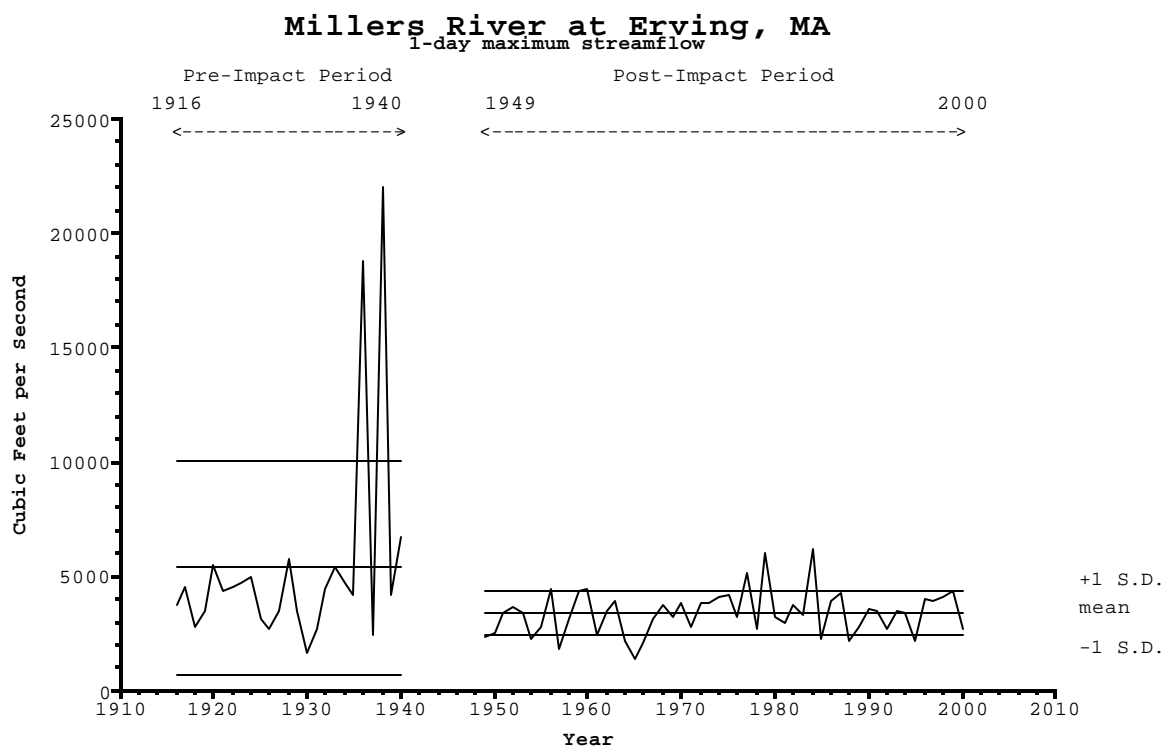


Figure 8.5.1.2-18

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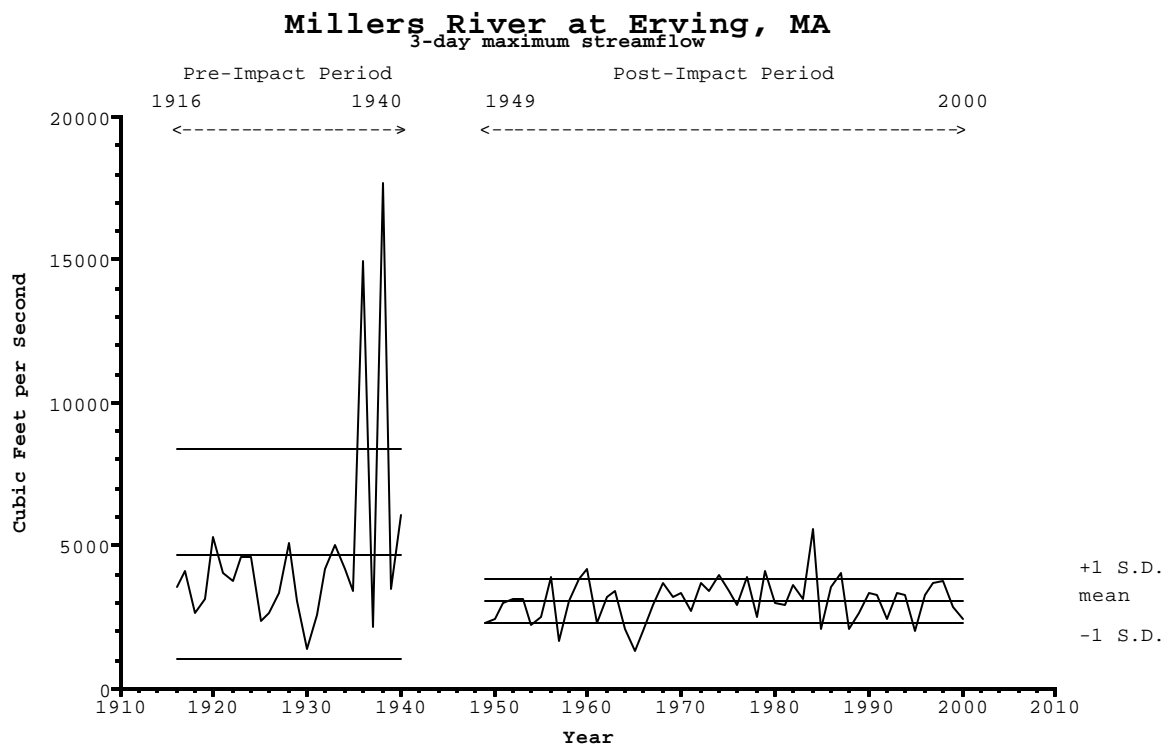


Figure 8.5.1.2-19

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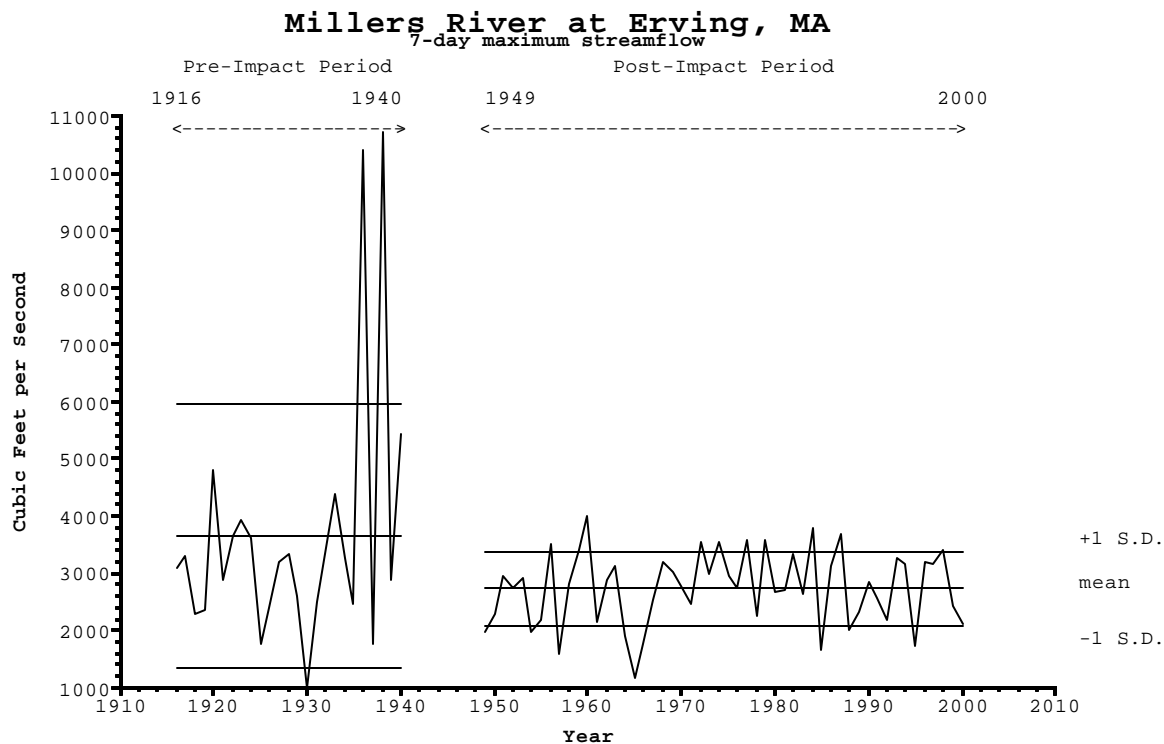


Figure 8.5.1.2-20

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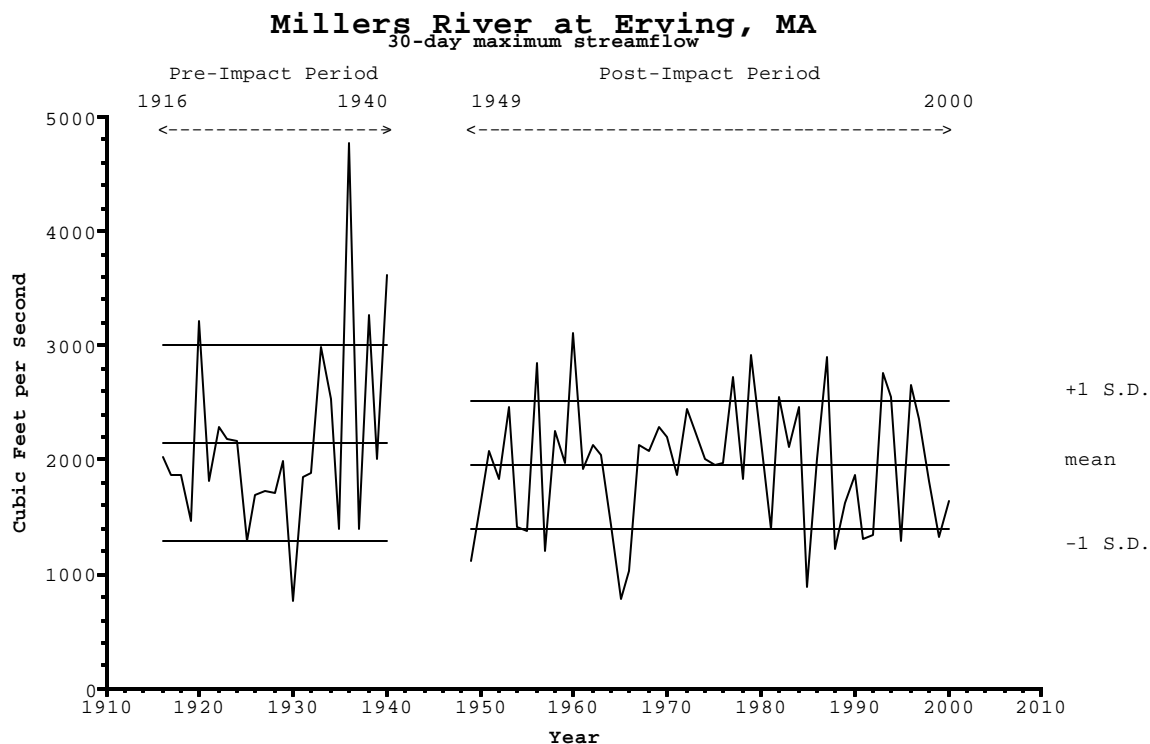


Figure 8.5.1.2-21

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

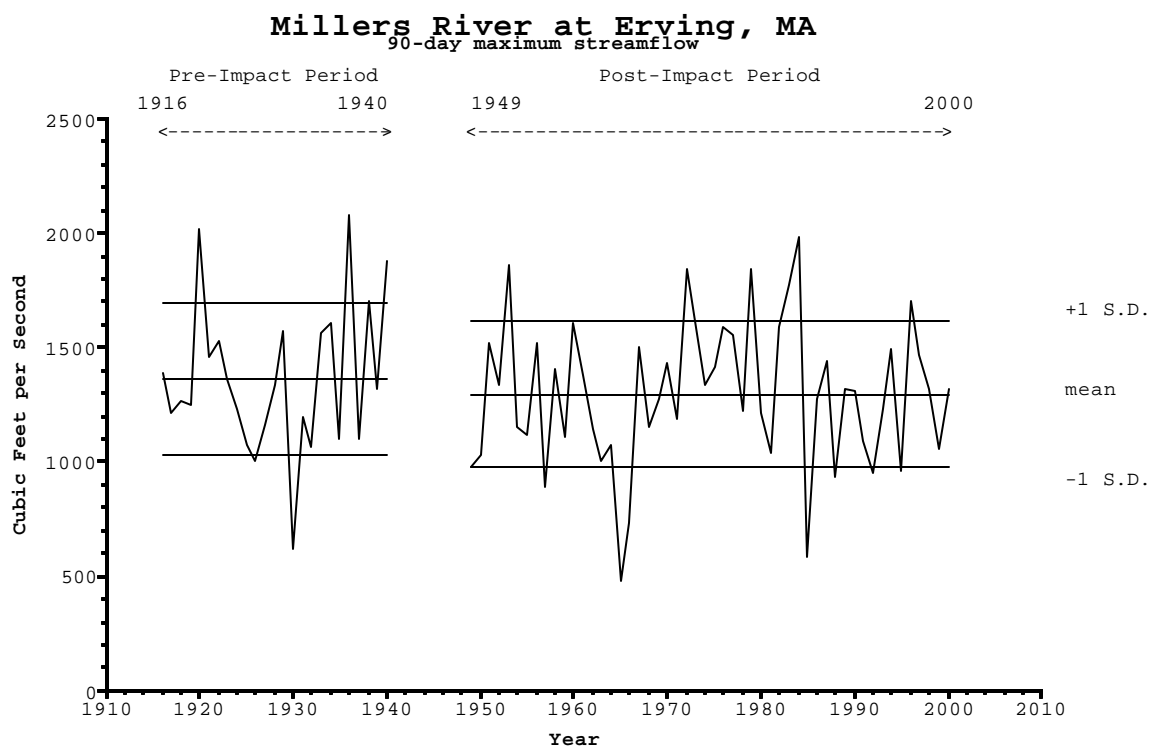


Figure 8.5.1.2-22

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

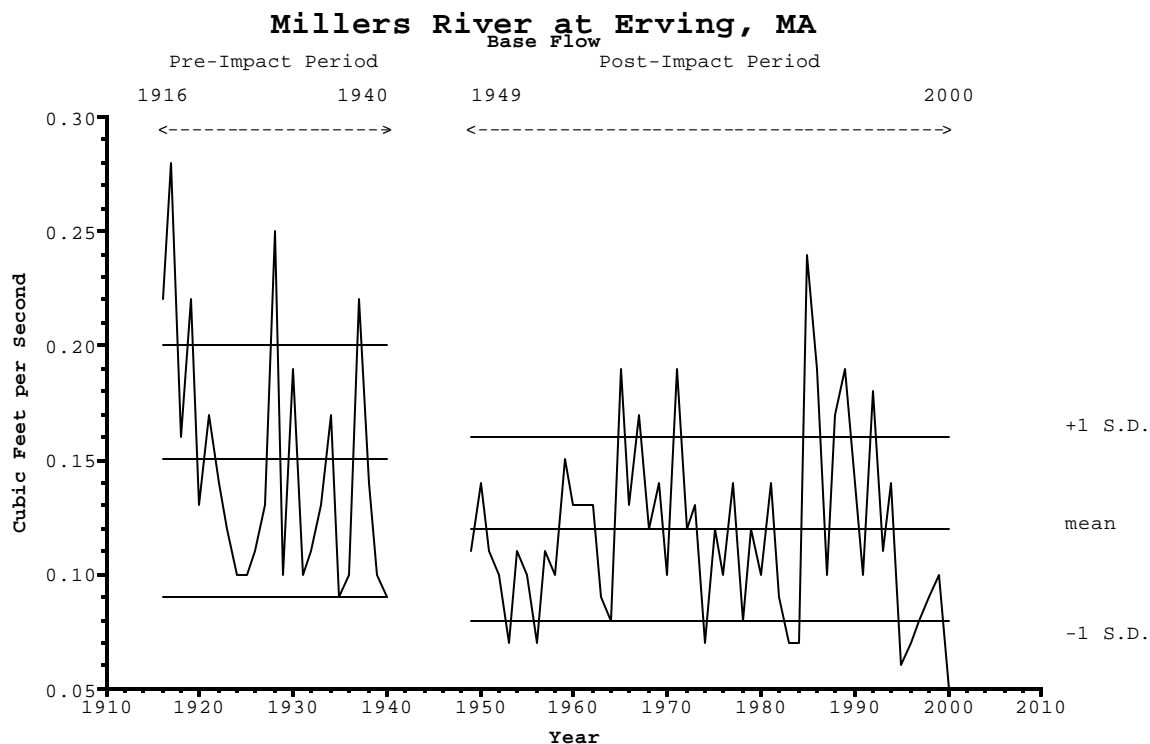


Figure 8.5.1.2-23

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

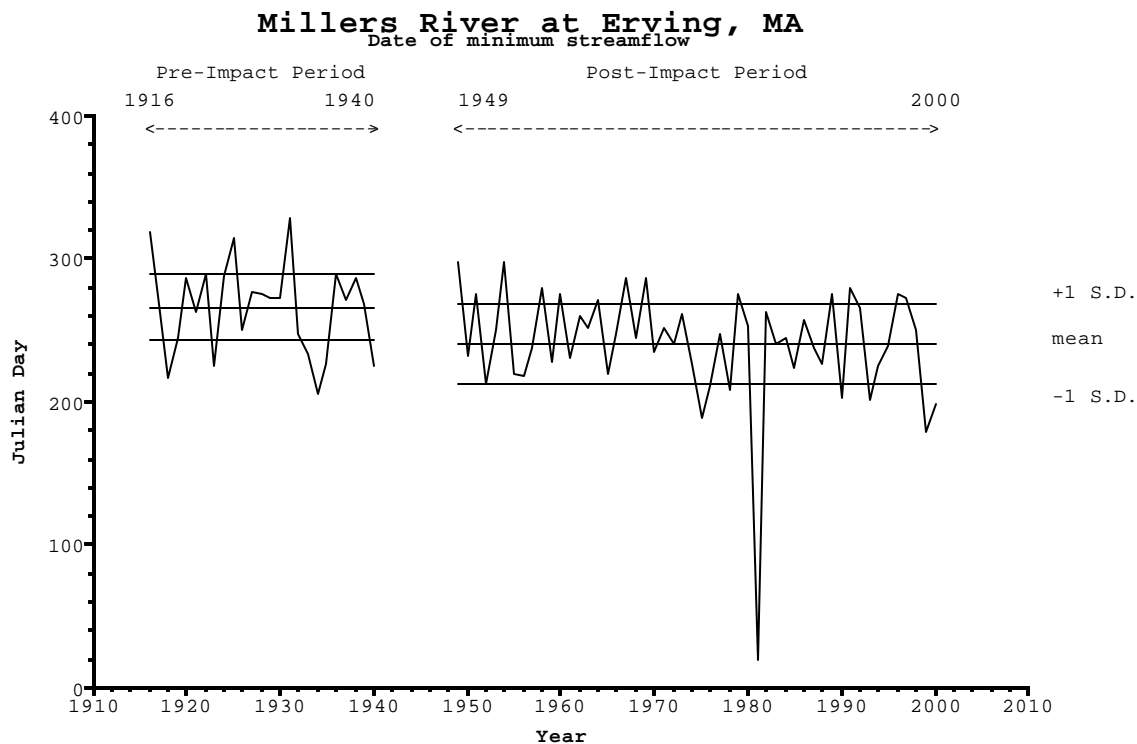


Figure 8.5.1.2-24

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw



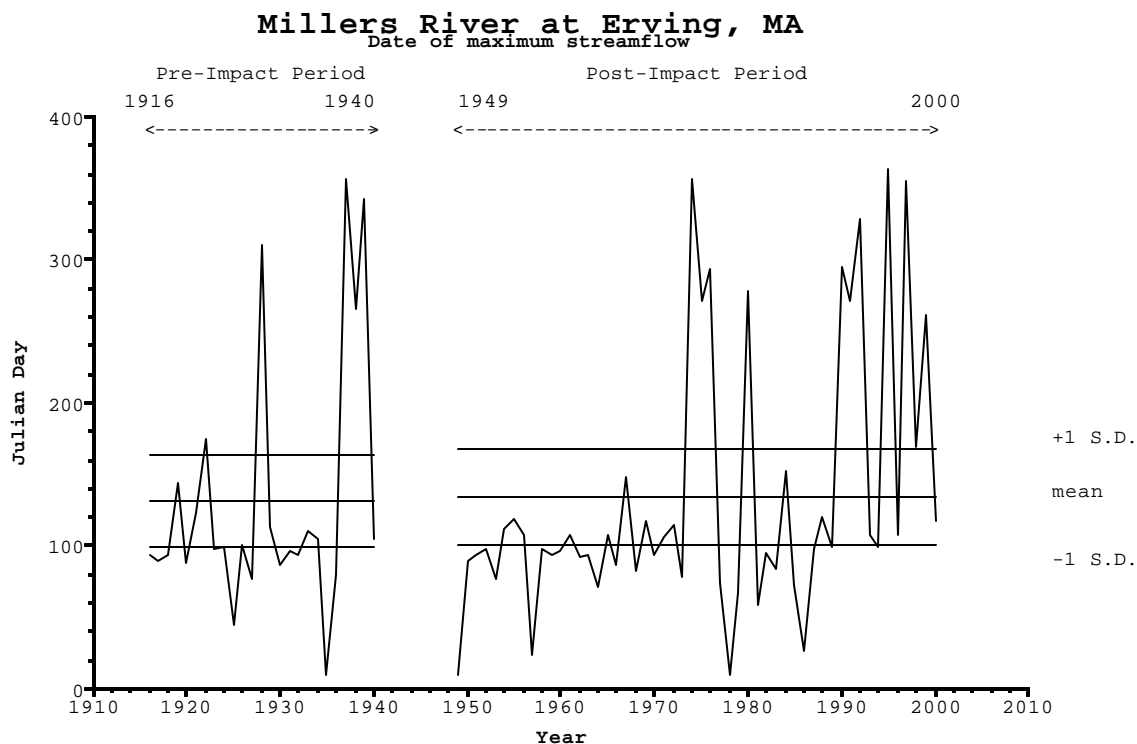


Figure 8.5.1.2-25

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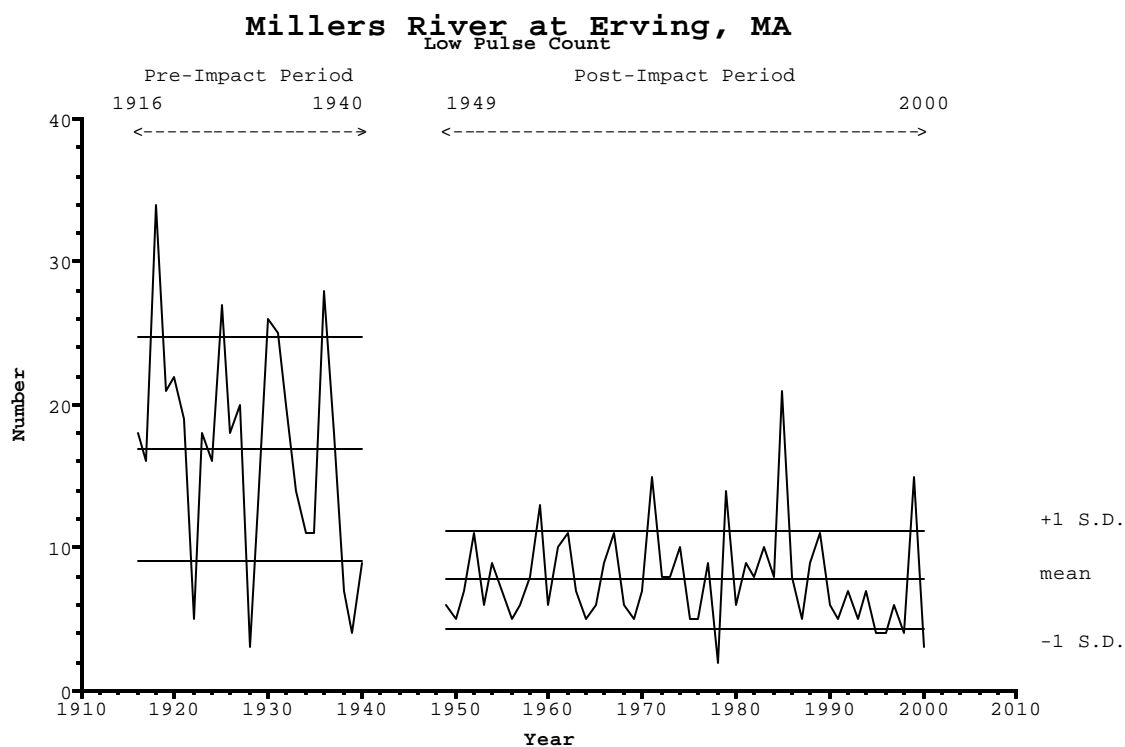


Figure 8.5.1.2-26

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

# Millers River at Erving, MA

Low Pulse Duration

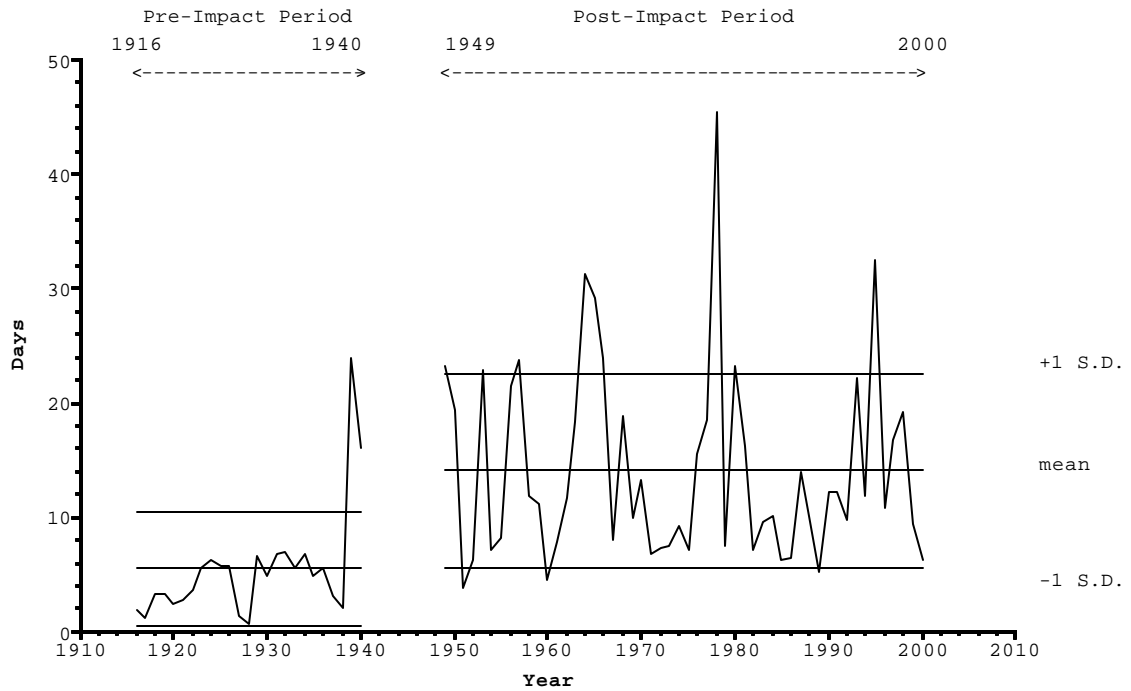


Figure 8.5.1.2-27

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

# Millers River at Erving, MA

High Pulse Count

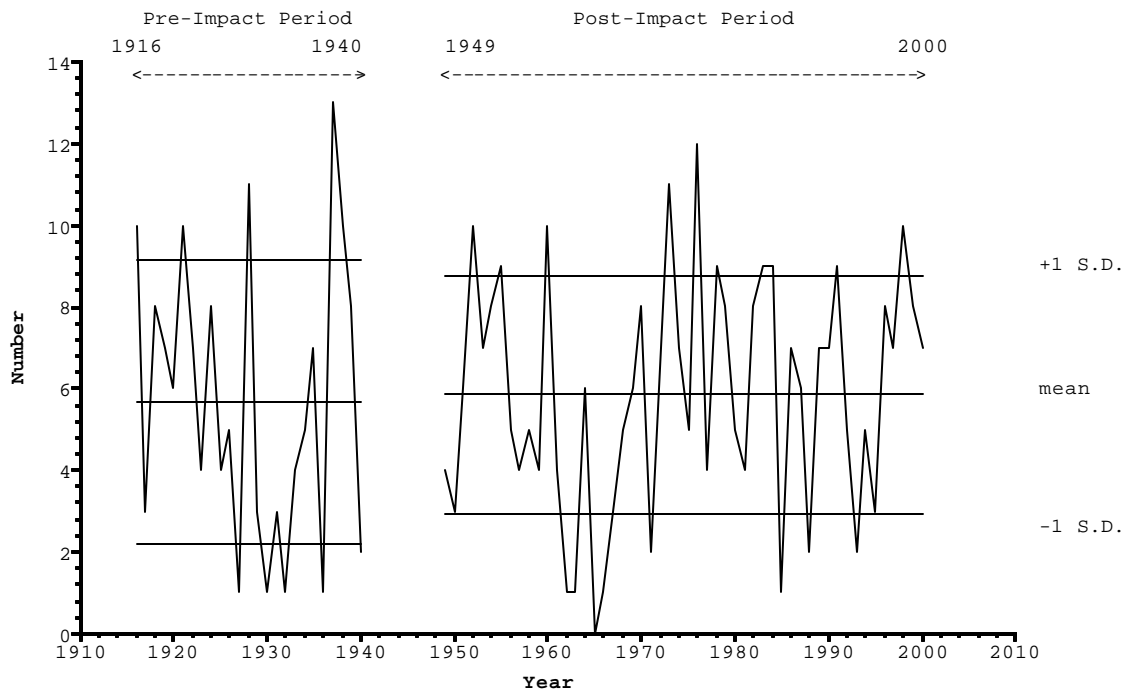


Figure 8.5.1.2-28

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

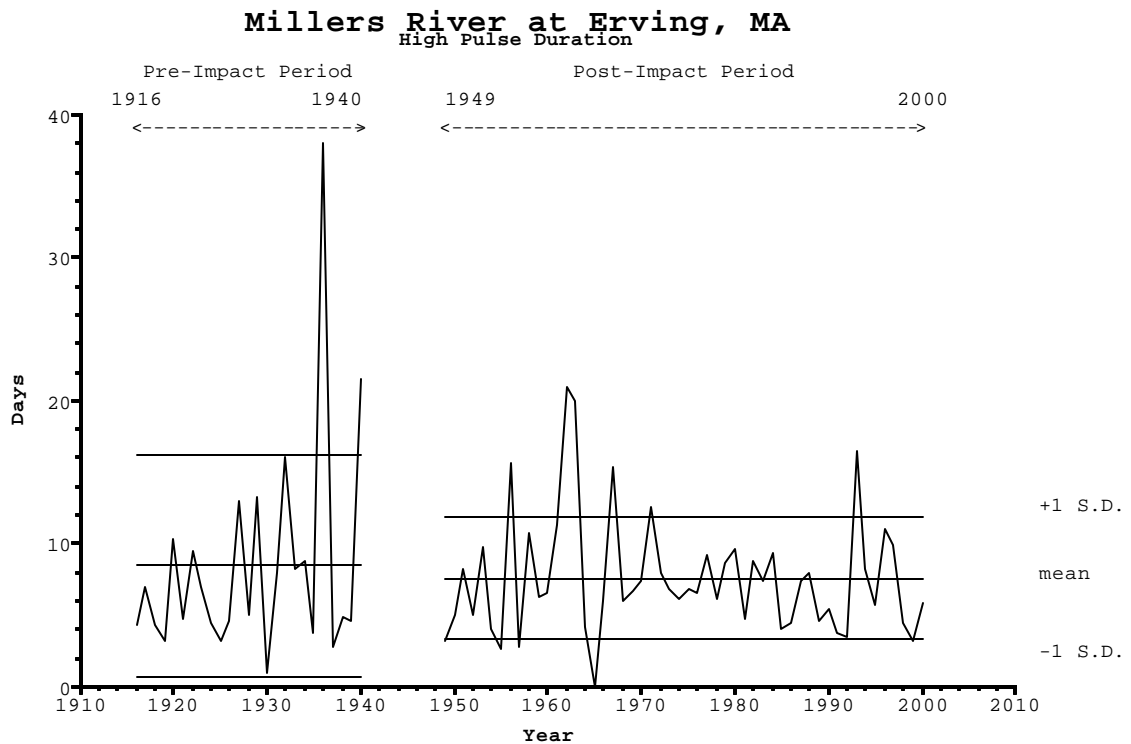


Figure 8.5.1.2-29

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

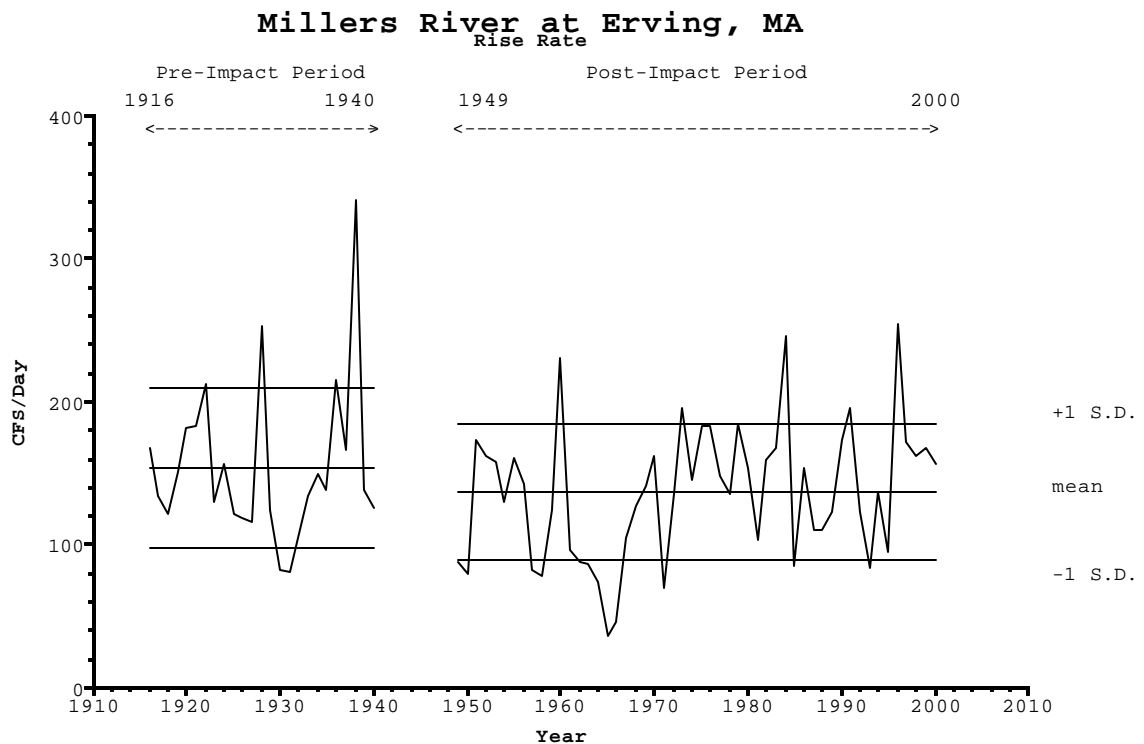


Figure 8.5.1.2-30

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

# Millers River at Erving, MA

Fall Rate

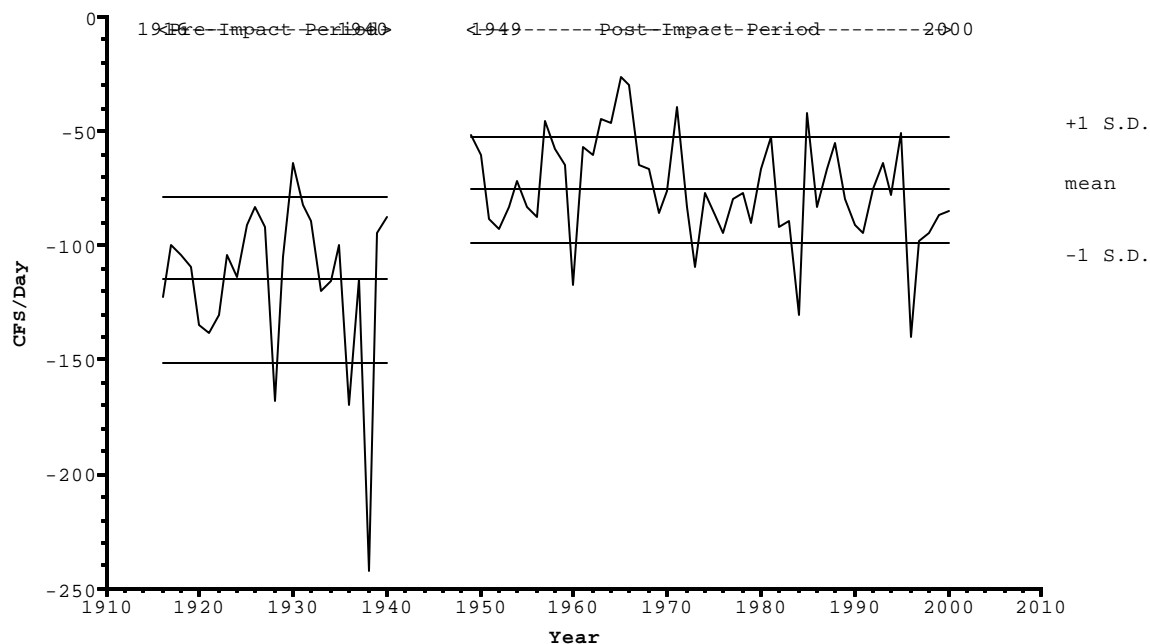


Figure 8.5.1.2-31

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

# Millers River at Erving, MA

Reversals

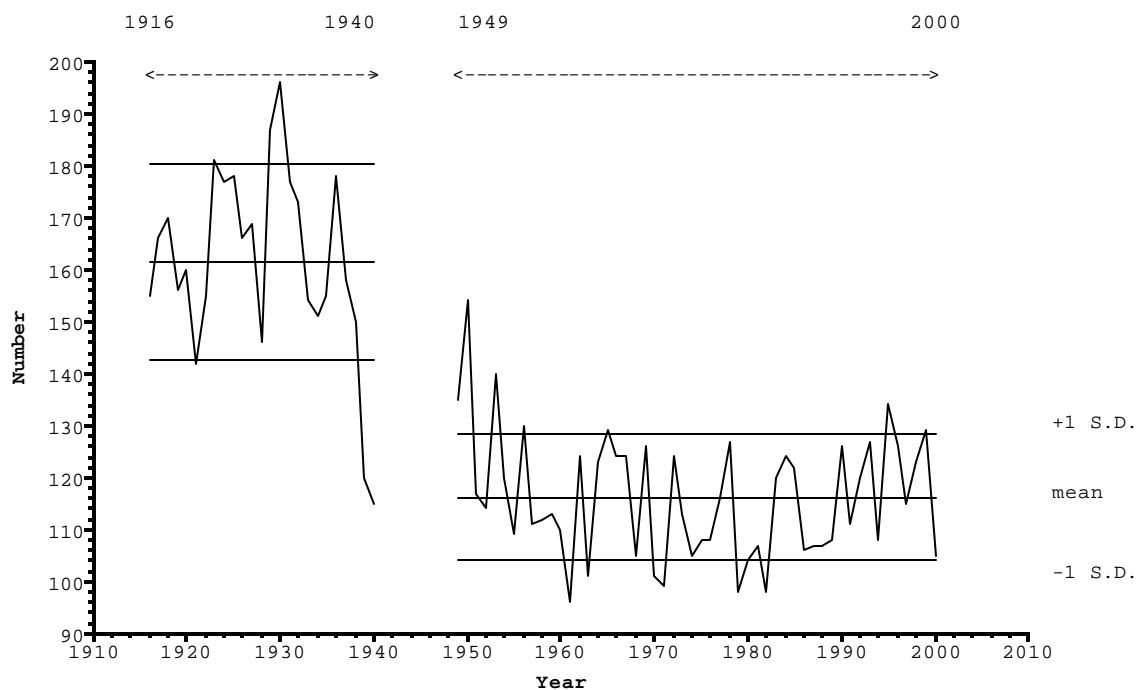


Figure 8.5.1.2-32

File(s) Used: C:\NHA\millere.ann, C:\NHA\millere.baw

## **APPENDIX A**

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### **DAMS LOCATED IN THE MILLERS RIVER BASIN**

APPENDIX A: DAMS LOCATED IN THE MILLERS RIVER BASIN

<b>MASSACHUSETTS</b>															
<b>Town</b>	<b>Dam name</b>	<b>MHD District</b>	<b>County</b>	<b>Town</b>	<b>Dam</b>	<b>Basin</b>	<b>Owner</b>	<b>Own</b>	<b>Hazard</b>	<b>Purpose</b>	<b>Year</b>	<b>Struct.</b>	<b>Drainage</b>	<b>Max.imp.</b>	<b>FERC</b>
		<b>No.</b>	<b>No.</b>	<b>No.</b>	<b>No.</b>	<b>No.</b>		<b>Type</b>	<b>Class</b>	<b>(see key below)</b>	<b>Constr.</b>	<b>Height, ft</b>	<b>Area sq.mi</b>	<b>acre-ft</b>	<b>Regulated</b>
Ashburnham	Farm Pond Dam	3	14	11	11	07	Lauri E. Rahnasto	10	L		0	0	0	0	N
Ashburnham	Small's Pond Dam	3	14	11	9	07	Robert Young	10	L	R, fire	0	8	17	5.6	N
Ashburnham	Old Foster Road Mill Dam	3	14	11	6	07	Town Of Ashburnham	20	L	I	0	0	0	0	N
Ashburnham	Sunset Lake Dam	3	14	11	2	07	Far Hills Association	11	L	R	1900	12	7.5	1785	N
Ashburnham	Farm Pond Dam	3	14	11	46	07	Floyd & Barbara Collar	10	L		0	0	0	0	N
Ashburnham	Duck Pond Dam	3	14	11	43	07	John Pilgren	10	L		0	0	0	0	N
Ashburnham	Quag Pond Dam	3	14	11	42	07	Unknown	10	L		0	0	0	0	N
Ashburnham	Old Mill Pond Dam	3	14	11	44	07	Joseph N. Or Eva Gautreau	10	L		0	0	0	0	N
Ashburnham	Pool Dam	3	14	11	1	07	Harold & Alice Lacroix	10	L		0	0	0	0	N
Ashburnham	Lathe Mill Pond Dam	3	14	11	13	07	Fitchburg Sportsmens Club	11	S	R	1900	9	1.3	0	N
Ashburnham	Old Saw Mill Pond Dam	3	14	11	12	07	Fitchburg Sportsmen's Club	11	S	R	1900	8	1.7		N
Ashburnham	Lower Naukeag Lake Dam	3	14	11	7	07	Town Of Ashburnham	20	H	R	1900	14	12	2800	N
Ashburnham	Upper Naukeag Lake Dam	3	14	11	8	07	Town Of Ashburnham	20	H	S	1875	8	2	3100	N
Ashburnham	Wallace Pond Dam	3	14	11	11	07	Fitchburg Sportsmen's Club	11	S	R	0	10	4	0	N
Ashburnham	Swimming Pool Dam	3	14	11	7A	07	Naukeag Lake Club	10	L		0	12	0	0	N
Athol	Newton Reservoir Dam	3	14	15	26	07	Town Of Athol	20	L	S	1924	30	1	230	N
Athol	Lawton Pond Dam	3	14	15	62	07	R.H. Lawton	10	L		0	0	0	0	N
Athol	Bemis Pond Dam	3	14	15	61	07	C.R. Bemis	10	L		0	0	0	0	N
Athol	Farm Pond Dam	3	14	15	60	07	Mr. Fisher	10	L		0	0	0	0	N
Athol	Chase Pond Dam	3	14	15	44	07	Eugene Legrand	10	L		0	0	0	0	N
Athol	Old Mill Pond Dam	3	14	15	16	07	Oscar L. Norton	10	L		0	0	0	0	N
Athol	Diversion Dam	3	14	15	27	07	Packard Heights Assoc.	10	L		0	0	0	0	N
Athol	Lake Ellis Dam	3	14	15	13	07	Town Of Athol	20	L	R	1900	15	4.3	1000	N
Athol	New Quinlan Pond Dam	3	14	15	45	07	Roy D. Wetmore	10	S		0	0	0	0	N
Athol	Cass Pond Dam	3	14	15	63	07	Bradford Cass	10	L	REC	0	7	0	7	N
Athol	Athol Manufacturing Dam(Ferc)	3	14	15	4	07	L.P. Athol Corp.	10	H	CH	1923	19	200	360	Y
Athol	Lake Rohunta Dam	3	14	15	40	07	Rodney Hunt Machine Co.	10	L	R	1909	26	0	2420	N
Athol	Sportsmans Pond Dam	3	14	15	48	07	Athol Rod & Gun Club Inc.	10	S	R	1900	12	1.4	0	N
Athol	Sportsman'S Pond Dam	3	14	15	64	07	R.H. Lawton	10	L		0	0	0	0	N
Athol	Riceville Pond Dam	3	14	15	51	07	Comm of Mass - D E M	30	L	R	1950	18	5	1450	N
Athol	Canal Dam	3	14	15	25	07	Athol Machine & Foundry	10	L		0	0	0	0	N
Athol	White Pond Dam	3	14	15	35	07	White Pond Association	10	L	R	1963	15	2000	730	N
Athol	South Athol Pond Dam	3	14	15	38	07	Morgan Memorial Fresh Air	10	S	R	0	15	9.6	0	N
Athol	Tully River Or Fryville Pond Dam	3	14	15	28	07	Packard Heights Assoc.	10	S	CR	1920	10	1800	132	N
Athol	Crescent Street Dam	3	14	15	6	07	L.S. Starrett Co.	10	H	HS	1900	28	201	87	N
Athol	Reservoir #2 Dam	3	14	15	50	07	Retreat Trust	10	S	RC	1900	16	0.9	0	N
Athol	Current Dam	3	14	15	5	07	L.P. Athol Corp.	10	S		0	0	0	0	N
Athol	Ward Pond Dam	3	14	15	42	07	John F. Whiston	10	S		0	0	0	0	N
<b>Hazard Class: H=high , S=significant, L=low</b>															
<b>Purpose: R-Recreation, F-Fish and Wildlife Pond, H-Hydroelectric, C-Flood Control, I-Irrigation, N-Navigation, S-Water Supply, P-Fire Protection</b>															

MASSACHUSETTS (continued)																
Town	Dam name	MHD District	County	Town	Dam	Basin	Owner	Own	Hazard	Purpose	Year	Struct.	Drainage	Max.imp.	FERC	
		No.	No.	No.	No.	No.		Type	Class	(see key below)	Constr.	Height, ft	Area sq.mi	acre-ft	Regulated	
Athol	Filter Plant Dam	3	14	15	9	07	Town Of Athol	20	S		0	0	0	0	N	
Athol	Lake Ellis Dam	3	14	15	8	07	Town Of Athol	20	L		0	0	0	0	N	
Athol	1000 Acre Pond Dam	3	14	15	49	07	Town Of Athol	20	L		1939	24	3.2	6	N	
Erving	Millers Falls Tool Co. Dam	2	6	91	1	07	Erving Industrial Park	10	L		0	20	0	0	N	
Erving	Northfield Mt. Main Dam	2	6	91	3B	07	Northeast Generation Co.	50	S	H	1972	140	400000	17000	Y	
Erving	Krusiewick Pond Dam	2	6	91	2	07	L.A. Hoff	10	L		0	11	0	0	N	
Erving	Northfield Mt. West Dike Inlet	2	6	91	3A	07	Northeast Generation Co.	50	S	H	1972	52	0	17000	N	
Erving	Northfield Mt. Nw Dike & Spillway	2	6	91	3C	07	Northeast Gen. Co.	50	S	H	0	30	0	17000	N	
Gardner	Distribution Reservoir Dam	3	14	103	20	07	City Of Gardner	20	L	S	1915	20	0	0	N	
Gardner	Wildwood Lake Dam(Nj)	3	14	103	15	07	City Of Gardner	20	L		0	0	0	0	N	
Gardner	Wayside Pond Dam	3	14	103	10	07	City Of Gardner	20	S	C	1965	8	2	0	N	
Gardner	Old Poor Farm Pond Dam	3	14	103	16	07	City Of Gardner	20	L	CR	1973	16	0	0	N	
Gardner	Ramsdall Pond Dam	3	14	103	4	07	Steven Ruscio	10	L		0	12	8.9	0	N	
Gardner	Old Mill Storage Pond Dam	3	14	103	2	07	Clyde L. Hunting	10	L		0	0	0	0	N	
Gardner	Milchey Pond Dam	3	14	103	19	07	St. Pauls Episcopal Church	11	L	R	0	9	0	0	N	
Gardner	Farm Pond Dam	3	14	103	22	07	Andre A. Croteau	10	L		0	0	0	0	N	
Gardner	Stump Pond Dam	3	14	103	41	07	Comm of Mass - D E M	30	L		0	16	0	0	N	
Gardner	Mahoney Pond Dam	3	14	103	9	07	City Of Gardner	20	S	C R	1965	7	5.6	13	N	
Gardner	Crystal Lake Dike	3	14	103	21	07	City Of Gardner	20	L	S	1900	5	0	1450	N	
Gardner	Parker Pond Dam	3	14	103	12	07	City Of Gardner*	20	S	R	1925	14	6.6	450	N	
Gardner	Beagle Pond Dam	3	14	103	24	07	West End Beagle Club	10	S	R	1962	16	3	14	N	
Gardner	Old Duck Pond Dam	3	14	103	33	07	Comm of Mass - D E M	30	L		0	0	0	0	N	
Gardner	Old Ice Pond Dam	3	14	103	32	07	Comm of Mass - D E M	30	L		0	0	0	0	N	
Gardner	Murdock Pond Dam	3	14	103	31	07	Dennis D. Gagnon	10	L		0	0	0	0	N	
Gardner	Perley Brook Reservoir Dam	3	14	103	13	07	City Of Gardner	20	H	S	1967	50	2.7	1100	N	
Gardner	Cowee Pond Dam	3	14	103	14	07	City Of Gardner	20	H	S	1900	15	1.2	265	N	
Gardner	Dunn Pond Dam	3	14	103	22	07	Comm of Mass - D E M	30	S	R	1934	13	0.8	130	N	
Gardner	Bents Pond Dam	3	14	103	5	07	S. Bent Bros. Co. Inc.	10	L	O	1912	15	60	86	N	
Gardner	Wrights Reservoir Dam	3	14	103	11	07	City Of Gardner	20	H	CR	1965	18	3.2	2693	N	
Hubbardston	Bents Pond Dam	3	14	140	19	07	S. Bent Bros. Co. Inc.	10	S	RS	1900	11	1900	162	N	
Orange	North Pond Brook Dam	2	6	223	19	07	Town Of Orange	20	S	O	1890	10	0	140	N	
Orange	Fire Pond Dam	2	6	223	18	07	John J. Magee	10	L		0	0	0	0	N	
Orange	Eagleville Dam	2	6	223	2	07	Rodney Hunt Machine Co.	10	L	R	0	8	0	0	N	
Orange	Williams Pond Dam	2	6	223	13	07	Town Of Orange	20	L	R	0	16	1.7	15	N	
Orange	Gale Brothers Dam	2	6	223	9	07	Town Of Orange	20	L	P	0	16	1.3	0	N	
Orange	Plazas Pond Dam	2	6	223	2	07	Michael Plaza Etal	10	S	R	1900	9	550	300	N	
Orange	Haskins Pond Dam	2	6	223	6	07	Mr. Earl F. Harris	10	S	RC	1880	15	9.6	80	N	
Hazard Class: H=high , S=significant, L=low																
Purpose: R-Recreation, F-Fish and Wildlife Pond, H-Hydroelectric, C-Flood Control, I-Irrigation, N-Navigation, S-Water Supply, P-Fire Protection																

MASSACHUSETTS (continued)																
Town	Dam name	MHD District	County	Town	Dam	Basin	Owner	Own	Hazard	Purpose	Year	Struct.	Drainage	Max.imp.	FERC	
		No.	No.	No.	No.	No.		Type	Class	(see key below)	Constr.	Height, ft	Area sq.mi	acre-ft	Regulated	
Orange	New Home Sewing Machine Company Dam	2	6	223	1	07	Chase Industrial Supply	10	L	H	1942	10	323	452	Y	
Orange	Whites Pond Dam	2	6	223	10	07	Edward F. Ryan	10	L	R	1940	13	0.1	100	N	
Orange	Tully Pond Dam	2	6	223	11	07	Town Of Orange	20	S	R	1970	20	1.2	480	N	
Orange	Packard Pond Dam	2	6	223	12	07	Packard Heights Assoc.	10	S	R	1930	30	0.2	0	N	
Orange	Pumping Station Dam	2	6	223	5	07	Town Of Orange	20	S	S	1892	15	0	5	N	
Orange	Orange District Reservoir Dam	2	6	223	16	07	Town Of Orange	20	S	S	1892	20	0	12	N	
Orange	Minute Tapioca Lower Pond Dam	2	6	223	3	07	Lona Howe	10	L	R	0	10	1.7	0	N	
Orange	Diversion Dam	2	6	223	8	07	Papenean,Lord,Gale &Warick	10	L		0	5	0	0	N	
Orange	Minute Tapioca Upper Pond Dam	2	6	223	3	07	Lona Howe	10	L	R	1923	4	1.7	0	N	
Orange	Mahar Regional School Dam	2	6	223	14	07	Mahar Regional School Dist	10	L	R	1960	9	0.4	0	N	
Orange	Boston Fibre Co. Dam	2	6	223	7	07	Annabelle H. Haven	10	L		0	12	0	0	N	
Orange	Johnsonian Pond Dam	2	6	223	17	07	Alexander G. Schmidt	10	L	R	0	10	0.5	0	N	
Orange	Randal L. Pond Dam	2	6	223	20	07	Orange Econ. Dev. Commiss	20	L	ROT	1999	10	0.18	22	N	
Petersham	Davenport Pond Dike	3	14	234	11	07	H. Davenport	10	L		0	0	0	0	N	
Petersham	Davenport Pond Dam	3	14	234	11	07	H. Davenport	10	L		0	0	0	0	N	
Phillipston	Storage Pond Dam	3	14	235	9	07	J.A. Robertson	10	S		0	0	0	0	N	
Phillipston	Private Pond Dam	3	14	235	2	07	Fred E. French	10	L		0	0	0	0	N	
Phillipston	Old Ice Pond Dam	3	14	235	3	07	Homer C. Blais	10	L		0	0	0	0	N	
Phillipston	Stone Bridge Reservoir Dam	3	14	235	8	07	Comm of Mass - M D C	33	L		0	0	0	0	N	
Phillipston	Cheney Pond Dam	3	14	235	14	07	Francis A. Cheney	10	L		0	0	0	0	N	
Phillipston	Browns Pond Dam	3	14	235	7	07	Comm of Mass - M D C	33	L		0	0	0	0	N	
Phillipston	Moccasin Brook Dam	3	14	235	18	07	Robert F. Whiteside	10	L		0	0	0	0	N	
Phillipston	Bates Power Reservoir Dam	3	14	235	6	07	Clarence C. Specht	10	S	R	1920	11	0.7	135	N	
Phillipston	Small Privilege Pond Dam	3	14	235	5	07	Town Of Athol	20	L		0	0	0	0	N	
Phillipston	Phillipston Reservoir Dam	3	14	235	1	07	Town Of Athol	20	S	S	1895	15	0.42	143	N	
Royalston	Tully Dam(Uscoe)	3	14	255	16	07	Us Army Corp Of Engineers	40	H	CR	1949	62	0	35800	N	
Royalston	Birch Hill Dam(Uscoe)	3	14	255	15	07	Us Army Corp Of Engineers	40	H	C	1942	56	0	76000	N	
Royalston	Small Pool Dam	3	14	255	18	07	R. Boyce	10	L		0	0	0	0	N	
Royalston	Fish Pool Dam	3	14	255	17	07	Winchendon Rod & Gun Club	10	L		0	0	0	0	N	
Royalston	Putney Mill Dam	3	14	255	14	07	David C. Putney	10	L	R	1893	12	14	352	N	
Templeton	Peaceful Pines Pond Dam	3	14	294	32	07	Peaceful Pines Inc.	10	L		0	0	0	0	N	
Templeton	East Templeton Storage Pond Dam	3	14	294	17	07	L.M. & A.K. Holonbo	10	L		0	0	0	0	N	
Templeton	Fernald School Pond Dam	3	14	294	24	07	Comm of Mass - D E M	34	L		0	0	0	0	N	
Templeton	Brickyard Pond Dam	3	14	294	26	07	Otter River Sportsmen Club	10	L		0	0	0	0	N	
Templeton	Beamon'S Pond Dam	3	14	294	8	07	Comm of Mass - D E M	30	L		0	11	0	0	N	
Templeton	Brooks Pond Dam	3	14	294	29	07	Lois Brooks	10	L		0	0	0	0	N	
Templeton	Salame Pond Dam	3	14	294	30	07	Stephen E. Salame	10	L		0	0	0	0	N	
Hazard Class: H=high , S=significant, L=low																
Purpose: R-Recreation, F-Fish and Wildlife Pond, H-Hydroelectric, C-Flood Control, I-Irrigation, N-Navigation, S-Water Supply, P-Fire Protection																



MASSACHUSETTS (continued)																
Town	Dam name	MHD District	County	Town	Dam	Basin	Owner	Own	Hazard	Purpose	Year	Struct.	Drainage	Max.imp.	FERC	
		No.	No.	No.	No.	No.		Type	Class	(see key below)	Constr.	Height, ft	Area sq.mi	acre-ft	Regulated	
Templeton	Graves Pond Dam	3	14	294	31	07	Wilfred J. Graves	10	L		0	0	0	0	N	
Templeton	Bourn-Hadley Pond Dam	3	14	294	21	07	Boleslaw L. Gaidanowicz	10	L	R	1940	12	1800	120	N	
Templeton	Ridgeley Country Club Pond Dam	3	14	294	9	07	Ridgeley Country Club	10	S	R	1900	12	0	62	N	
Templeton	Otter River Dam	3	14	294	1	07	Seaman Paper Co. Inc.(?)	10	L	none	1900	10	0	106	N	
Templeton	Partridgeville Pond Dam	3	14	294	19	07	Templeton Fish & Game Club	10	S	R	1900	12	3150	176	N	
Templeton	Baldwin Water Supply Pond Dam	3	14	294	7	07	American Tissue	10	S	O	1900	9	0.5	78	N	
Templeton	Brazell Pond Dam	3	14	294	22	07	Timothy Dalton	10	S	R	1900	9	425	61	N	
Templeton	Wetmore Pond Dam	3	14	294	24	07	Roy D.Wetmore	10	S	R	1900	16	1700	95	N	
Templeton	Templeton Center Burus Pond Dam	3	14	294	20	07	Comm of Mass - D E M	34	L		0	0	0	0	N	
Warwick	Sheomet Lake Dam	2	6	312	7	07	Comm of Mass - D E M	30	S	R	1924	17	5.4	360	N	
Warwick	Hastings Pond Dam	2	6	312	6	07	Harold Torstenson	10	L		0	3	0	0	N	
Warwick	Gales Pond Dam	2	6	312	3	07	Elizabeth S. Earle	10	L	R	1932	19	550	130	N	
Warwick	Moorse Pond Dam	2	6	312	2	07	George Shepardson Jr.	10	L	R	1932	13	3500	300	N	
Warwick	Richards Hill Fenton Dam	2	6	312	4	07	Edwin A. Gillespie	10	S		0	9	0	0	N	
Warwick	Laurel Lake Dam	2	6	312	8	07	Comm of Mass - D E M	30	L	R	1935	9	1.1	440	N	
Warwick	Wheeler Pond Dam	2	6	312	1	07	Harry G. Richardson	10	L	R	1870	22	6000	330	N	
Warwick	Richards Reservoir Upper Dam	2	6	312	5	07	Comm of Mass - D E M	30	L	RS	1930	8	0.8	123	N	
Warwick	Russell Webster Pond Dam	2	6	312	9	07	Russell F. Webster	10	L		0	0	0	0	N	
Wendell	Wickett Pond Dam	2	6	319	5	07	Comm of Mass - D E M	30	L	0	0	0	0	0	N	
Wendell	Bowens Pond Dam	2	6	319	4	07	John D. Robinson	10	L	R	1900	12	400	90	N	
Wendell	Ruggles Pond Dam	2	6	319	3	07	Comm of Mass - D E M	30	S	R	1937	6	1.15	45	N	
Westminster	Pierce Pond Dam	3	14	332	15	07	Leo G. Leloux	10	S	R	1900	9	1370	85	N	
Westminster	Minott Pond Dam	3	14	332	3	07	Town Of Westminster	20	L	RO	1900	9	3270	54	N	
Winchendon	Beaman Pond Dam	3	14	343	21	07	Comm of Mass - D E M	30	L	R	0	18	2.5	35	N	
Winchendon	Norsky Dam	3	14	343	43	07	Alex P. Norsky	10	L		0	0	0	0	N	
Winchendon	Merrill Pond Dam	3	14	343	34	07	J.H. Davenport & Sons Co.	10	L		0	0	0	0	N	
Winchendon	Town Pumping Station Dam	3	14	343	20	07	Town Of Winchendon	20	L		0	0	0	0	N	
Winchendon	Brow'S Pond Dam	3	14	343	42	07	Town Of Winchendon	20	L		0	0	0	0	N	
Winchendon	Whites Mill Pond Dam	3	14	343	1	07	Mylec, Inc.	10	H	R/Fire con	1923	13	0.9	272	N	
Winchendon	Lake Monomonac Dam	3	14	343	3	07	Town Of Winchendon	20	H	R	1923	19	19	9080	N	
Winchendon	Whitney Pond Dam	3	14	343	5	07	Town Of Winchendon	20	H	CR	1880	25	53	2186	N	
Winchendon	Hunts Pond Dam	3	14	343	6	07	Mason & Parker Mfg. Co.	50	S	R	1936	16	800	120	N	
Winchendon	Stoddard Pond Dam	3	14	343	17	07	Mill Glen Pond Campers	10	S	R	1900	10	750	198	N	
Winchendon	Flis Pond Dam	3	14	343	23	07	Beverly Hurley	10	L	R	1944	10	0.2	32	N	
Winchendon	Tannery Pond Dam	3	14	343	7	07	Ernest J. Dionne	10	S	C	1875	17	5800	51	N	
Winchendon	Red Dam	3	14	343	2	07	Town Of Winchendon	20	H	R	2000	15	18.73	15	N	
Hazard Class: H=high , S=significant, L=low																
Purpose: R-Recreation, F-Fish and Wildlife Pond, H-Hydroelectric, C-Flood Control, I-Irrigation, N-Navigation, S-Water Supply, P-Fire Protection																

<b>NEW HAMPSHIRE</b>														
<b>Town</b>	<b>Name</b>	<b>Dam</b>	<b>County</b>				<b>Owner</b>	<b>Class (see below)</b>	<b>Hazard</b>	<b>Year Constr.</b>	<b>Struct. Height, ft</b>	<b>Drainage Area sq.mi</b>	<b>Max.imp. acre-ft</b>	<b>Impound. acre-ft</b>
FITZWILLIAM	SCOTT POND	084.03	CHES				MR RICHARD BULLOCK		A	1918	10	6.3	825	470
FITZWILLIAM	BRANCH KEMP BROOK	084.04	CHES											
FITZWILLIAM	SCOTT BROOK	084.05	CHES											
FITZWILLIAM	STONE POND DAM	084.06	CHES				ORWELL POND INC		A	1922	10	10.6	298	48
FITZWILLIAM	LAUREL LAKE DAM	084.07	CHES				FLEUR DE LIS CAMP		AA		4	2.8	575	
FITZWILLIAM	MEADOW POND DAM	084.08	CHES											
FITZWILLIAM	PRIEST BROOK DAM	084.09	CHES											
FITZWILLIAM	TARBELL BROOK DAM	084.10	CHES				BRIAN DAMON		AA	1918	9	11.8	12	10
FITZWILLIAM	BOYCE'S POND (HORSESHOE)	084.12	CHES				MARY & GEORGE WONS		A		11	1.54	160	105
FITZWILLIAM	SPORTSMAN POND AKA MEADOW POND	084.13	CHES				ASSOCIATED SPORTSMANS CLUB INC		A	1942	15	10.45	975	450
FITZWILLIAM	FARM POND DAM	084.14	CHES				MS RUTH CHASE		AA		3		3	1
JAFFREY	WILDLIFE POND	124.20	CHES				MR F S RICHARDSON		AA	1970	10	0.51	2.85	1.1
NEW IPSWICH	MOUNTAIN POND DAM	175.15	HILL				NEW ENGLAND FORESTRY FOUND		A	1938	13	1	154	59
NEW IPSWICH	ISLAND POND DAM	175.16	HILL				MR EDWIN MCGOWAN							
RICHMOND	TULLY BROOK I	202.01	CHES				DANIEL & CAROLYN OLNEY				10			
RICHMOND	BIG DAM ABBOTS POND	202.02	CHES				MORGAN RESERVE HOMEOWNERS ASSOC		AA	1924	8	1.86	43	35
RICHMOND	TULLY BROOK III	202.03	CHES				MORGAN RESERVE HOMEOWNERS ASSOC		AA	1922	8	0.43	3.2	2.5
RICHMOND	NORTHWEST POND DAM	202.04	CHES				MORGAN RESERVE HOMEOWNERS ASSOC				8			
RICHMOND	MORGAN RESERVE DAM	202.06	CHES				MORGAN RESERVE HOMEOWNERS ASSOC		AA		5	0.11	0.65	0.45
RICHMOND	LARRYS POND	202.07	CHES				MORGAN RESERVE HOMEOWNERS ASSOC		A	1970	18.5	0.63	100	70
RINDGE	LOWER DAMON RESERVOIR	203.01	CHES				JONAS DAMON REALTY CO INC		B	1832	15	11.68	800	525
RINDGE	DAMON UPPER RESERVOIR	203.02	CHES				MR JOHN HUNT		A	1835	9	10.8	300	120
RINDGE	PEARLY POND	203.03	CHES				PEARLY LAKE ASSOC		A	1935	7	2.8	750	500
RINDGE	ROBBINS POND	203.04	CHES				MR SCOTT BASSOFF		AA	1918	5.98	3.05	270	180
RINDGE	ISLAND POND	203.10	CHES				HAMPSHIRE COUNTRY SCHOOL		B	1920	16	2.31	212	148
RINDGE	MILL POND	203.11	CHES				HAMPSHIRE COUNTRY SCHOOL		A	1880	20	6.6	120	100
RINDGE	MILLER RIVER	203.12	CHES				MR DALLAS NORCROSS							
RINDGE	MILLER RIVER	203.13	CHES				MRS PEREGRINE WHITE		AA		13	9.75	21.45	40.95
RINDGE	MILLER RIVER III	203.14	CHES											
RINDGE	BANCROFT RESERVOIR	203.15	CHES				OWNERSHIP UNKNOWN		A	1935	15	0.44	180	144
RINDGE	CONVERSE MEADOW POND	203.16	CHES				MR JOHN B RICE				15			
RINDGE	MILLER RIVER	203.17	CHES				MR JOHN B RICE							
RINDGE	TARBELL BROOK	203.23	CHES				MS LINDA HARMON		AA	1945	10	6.9	10	3
RINDGE	TARBELL BROOK	203.24	CHES				MR BENTON RICE							
RINDGE	RECREATION POND	203.25	CHES				MR JOHN B RICE							
<b>Class AA structure means a dam the failure of which would not threaten life or property.</b>														
<b>Class A structure means a dam with a low hazard potential.</b>														
<b>Class B structure means a dam with a significant hazard potential.</b>														
<b>Class C structure means a dam with a high hazard potential.</b>														

NEW HAMPSHIRE								Hazard		Year	Struct.	Drainage	Max.imp.	Impound.	
Town	Name	Dam	County				Owner	Class (see below)			Constr.	Height, ft	Area sq.mi	acre-ft	acre-ft
RINDGE	TARBELL BROOK	203.26	CHES												
RINDGE	MILLER RIVER	203.27	CHES				MR A J WELLINGTON								
RINDGE	EMERSON POND	203.30	CHES												
RINDGE	EMERSON POND BROOK	203.31	CHES				MR HARRIS RICE								
RINDGE	EMERSON POND BROOK	203.32	CHES												
RINDGE	MILLER RIVER	203.33	CHES												
RINDGE	MILLER RIVER	203.34	CHES												
RINDGE	NAMELESS BROOK	203.35	CHES												
RINDGE	MILLER POND	203.38	CHES												
RINDGE	SPECKHAMS DAM	203.40	CHES				MR JOSEPH CONNOLLY	AA			6		0.3762		
RINDGE	STUMP POND	203.41	CHES				HAMPSHIRE COUNTRY SCHOOL	A		1980	8	0.39	72	40	
RINDGE		203.43	CHES												
RINDGE	VAN DYKE DAM	203.44	CHES				MR ROBERT VAN DYKE	A		1991	8	2.76	66	39	
RINDGE	TARBELL BROOK	203.45	CHES				MR RICHARD WHICKER	AA			8	7.6	5.3	2.6	
Class AA structure means a dam the failure of which would not threaten life or property.															
Class A structure means a dam with a low hazard potential.															
Class B structure means a dam with a significant hazard potential.															
Class C structure means a dam with a high hazard potential.															

## **APPENDIX B**

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**Correspondence between O'Connell Energy Group, Federal  
Energy Regulatory Commission and Trout Unlimited**

**Re: Operation of New Home Dam**

FEDERAL ENERGY REGULATORY COMMISSION  
Washington, D. C. 20426

## OFFICE OF ENERGY PROJECTS

Project No. 6096--Massachusetts  
New Home Dam Project  
O'Connell Energy Group

Mr. Carl LeGrand  
O'Connell Energy Group  
57 Suffolk Street  
Holyoke, MA 01040

DEC 10 2001

RE: Compliance with article 2

Dear Mr. LeGrand:

This regards your compliance with article 2 of your exemption for the New Home Dam Project, issued on December 28, 1984.<sup>1</sup> Article 2 requires that you operate the project maintaining a minimum flow of 152 cfs below the project, and 10 cfs in the bypassed reach, or inflow, whichever is less.

We received information that indicates you are not maintaining the flows required by article 2. So that we may fully evaluate this allegation, please provide within 30 days of the date of this letter the following information:

- (1) flow records and generation data documenting compliance with article 2 from August 1, 2001, through the date of this letter;
- (2) explanations for any deviations from those flows required by article 2; and
- (3) a description of any adverse impacts on the environmental resources that may have resulted from deviations from article 2, to include any comments you received from the Federal and state fish and wildlife agencies.

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<sup>1</sup> 29 FERC ¶ 61,356 (1984).

020130.0090.3

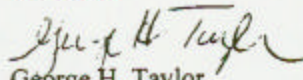
VAB  
FERC DOCKETED

Seven copies of your response should be filed with:

The Secretary  
Federal Energy Regulatory Commission  
Mail Code: DHAC, PJ-12.3  
888 First Street, NE  
Washington, DC 20426

Thank you for your cooperation. If you have any questions, please contact Diana Shannon at (202) 208-7774.

Sincerely,



George H. Taylor  
Chief, Biological Resources Branch  
Division of Hydropower Administration  
and Compliance

cc: Ms. Melissa Grader  
U.S. Fish and Wildlife Service  
70 Commercial Street, Suite 300  
Concord, NH 03301-5087



FEDERAL ENERGY REGULATORY COMMISSION  
Washington, D.C. 20426

## OFFICE OF ENERGY PROJECTS

Mr. Carl LeGrand  
O'Connell Energy Group  
57 Suffolk Street  
Holyoke, MA 01040

Project No. 6096-009-Massachusetts  
New Home Dam Project  
O'Connell Energy Group

FEB 12 2002

Subject: Compliance with requirements of exemption article 2; Requested actions

Dear Mr. LeGrand:

We received your January 9, 2002 response to our December 10, 2001 letter to you. In our letter, we indicated that we had been informed that you may not be maintaining flows downstream of the New Home Dam Project as required by article 2 of the project exemption.<sup>1</sup> We requested flow and generation data documenting compliance with article 2 for the period of August 1, 2001 through the date of our letter, explanations for any deviations from compliance, and information on any adverse impacts that may have occurred due to any deviations from article 2 requirements.

Exemption Requirements

Article 2 of the exemption requires that the project be operated in compliance with any terms and conditions that federal or state fish and wildlife agencies have determined appropriate to prevent loss of, or damage to, fish and wildlife resources. In a July 8, 1983 letter, the U.S. Fish and Wildlife Service (FWS) stipulated that the project provide an instantaneous minimum release of at least 152 cubic feet per second (cfs) below the project, or inflow, whichever is less.

Exemptee's Report

According to your January 9, 2002 report, the project uses an automated system that controls turbine operation based upon reservoir elevation. You indicated that you do not have any river flow records for the project, but that you do have pond elevation records, which are indicative of project operation and flow. You included copies of

<sup>1</sup> Order Granting Exemption From Licensing of a Small Hydroelectric Project of 5 Megawatts or Less, 29 FERC ¶ 61,356 (1984).

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FERC DOCKET#

reservoir elevation and generation data for the period in question. On all but two days during the period in question, the project was operated with the reservoir surface one or more inches below the dam crest elevation.<sup>2</sup> The graphs of reservoir level and generation you included indicate that project operation in the period in question occurred when the reservoir was below the crest elevation on all but two occasions. The project was operated at less than 100 kilowatts (kW), and often less than 60 kW, during most of the period in question, with generation starting and stopping one or more times each day. Outflow through generation has not been quantified at the project. During one 8-day period in late September, generation was off on only one occasion, but was increased and then reduced over very short periods of time several times each day. Project operation throughout the entire period caused, on most days, changes in reservoir elevation of approximately 1 to 1.5 inches.

You also indicated in your report that you had received data requests from the FWS in July 2001 after fluctuations had been noted at a U.S. Geological Survey (USGS) streamflow gage approximately 7 miles downstream. You included in your filing a copy of your response to the FWS, and you have attempted to reduce fluctuations by narrowing the distance between the reservoir level set points that control generation to one inch. However, you noted that the change resulted in little difference in river flows at the downstream gage.

To demonstrate that inflow to the project varies due to upstream manipulation, you included in your report a graph of river flow at a U.S. Army Corps of Engineers streamflow gage 5 miles upstream of the project for the period of August 27, 2001 through September 1, 2001. According to the data in that graph, inflow to the project varied regularly on a daily basis, with typical differences between daily high and low flows of about 50 cfs, and flows ranging from lows of about 90 to 110 cfs to highs of about 140 to 160 cfs.

You also included a graph plotting flows in cfs from the upstream Corps gage and the downstream USGS gage, covering the period of July 21, 2001 through July 26, 2001. You included the graph to illustrate your efforts to use available data in project operation.

---

<sup>2</sup> Telephone conversation between B. Peter Yarrington, Commission staff, and Carl LeGrand, O'Connell Energy Group, February 4, 2002. Staff was informed that the crest level at which spill occurs at the project is 502.10 feet, and that the exemptee attempts to operate the project with the reservoir level below the crest.



You noted that flow travel time between the two gages must be considered in using the data. The Corps has placed travel time at 12 to 18 hours, depending on flow rate. However, in examining the data in the graph, we note that flow variation at the upstream gage ranges primarily between 150 and 200 cfs, while flows at the downstream gage below your project range approximately from 100 to 200 cfs.

You indicated that you were not aware of any adverse impacts resulting from project operation during the period in question.

#### Discussion

In reviewing your January 9, 2002 report, it is clear that inflow to the New Home Dam Project does vary, apparently because of upstream water uses, and that the project is operated in a manner that takes these fluctuations into account.

However, with the information available, it is clear that the project as currently operated is producing or exacerbating marked changes in downstream flows on a daily basis. Your information indicates that the project is normally operated with reservoir levels below the level of the dam crest. Therefore, when the project is not operated, downstream flow is apparently released only through project leakage, which, according to our records, has only been quantified to the extent that it likely exceeds 10 cfs. When generation is started, this existing flow is quickly supplemented by generation flows, which you indicated have not been quantified.

#### Conclusions and Requested Actions

The project's exemption article 2 requires a minimum flow of 152 cfs below the New Home Dam Project, and that the project is to operate so that inflow is instantaneously passed when available flows drop below 152 cfs. After examination of the available information, it appears unlikely that the project operates in this required mode. You were unable to supply records specifying when flows were at or above 152 cfs, making it impossible for us to determine project compliance for the days during the period in question. The lack of data also indicates that it is unlikely that project operators have the information necessary to ensure the release of required flows at any particular time.

As a result of your inability to verify compliance with the flow requirements, and because operators at the New Home Dam Project apparently do not have access to timely information with which to ensure compliance, you need to file a streamflow compliance

4

and monitoring plan with the Commission. The plan should be filed for Commission approval, within 60 days of the date of this letter, and include the following elements.

1. A description of how the project will be operated to insure that inflows are released as quickly as possible following times when downstream flows fall below 152 cfs. This might be accomplished, for example, by changing the reservoir operating set points so that the upper limit is at or above the level of the spillway, reducing any lag time in flow release upon generation cessation.
2. A description of how flows below the project will be monitored and recorded to ensure and demonstrate compliance with exemption article 2. Methods could include, for example, the calculation of flows through the turbines at differing generation levels and a quantification of leakage; installation of a staff gage that would be checked several times a day; or installation of a transducer that would telemeter data to the powerhouse. The plan should include copies of any rating tables necessary to convert recorded data into cfs.
3. Copies of comments from the USGS and FWS regarding the plan, or copies of correspondence with these agencies indicating that they had sufficient time to examine the plan but had no comments.

Seven copies of the requested material should be filed with:

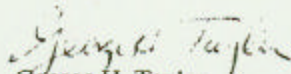
The Secretary  
Federal Energy Regulatory Commission  
Mail Code: DHAC, PJ-12.3  
888 First Street, N.E.  
Washington, D.C. 20426

Please also file a copy of your response with the Commission's New York Regional Office.

5

If you have any questions concerning the material you must file, please contact  
Pete Yarrington at (202) 219-2939.

Sincerely,



George H. Taylor  
Chief, Biological Resources Branch  
Division of Hydropower Administration  
and Compliance

cc: Melissa Grader  
U.S. Fish and Wildlife Service  
70 Commercial Street, Suite 300  
Concord, NH 03301-5087



ORIGINAL

O'CONNELL ENERGY GROUP

57 Suffolk Street, Suite 200, Holyoke, MA 01040

413-534-4660 • FAX 413-536-4911

RECEIVED  
02 APR -8 PM 4:49  
FEDERAL ENERGY  
REGULATORY COMMISSION

April 5, 2002

The Secretary  
Federal Energy Regulatory Commission  
Mail Code: DHAC, PJ - 12.3  
888 First Street, NE  
Washington, DC 20426

**RE: Project No. 6096-Massachusetts, New Home Dam**

Dear Secretary:

We are in receipt of your letter dated February 12, 2002 regarding compliance with Article 2 of our exemption for the New Home Dam project issued on December 28, 1984.

Due to the prolong drought in the North East United States over the past year river flows in the Miller River have varied drastically. Our method of operation of the hydroelectric facility at the New Home Dam has not presented any flow problems that we have been made aware of other than the initial request for information from USFWS on July 25, 2001. Since the drought began there have been times where the inflow to our facility fell below 152 CFS thus, resulting in cycling on and off of our equipment.

Determining the river flows during extremely low flow periods on the Miller River is very difficult. When the USGS Gage at Erving is showing flow rates range from 150-200 CFS, the Corps gauge in Athol is observed at the same time, showing flow rates ranging from 200-300 CFS. Apparently there is some discrepancies in the river flow volume as the upstream gauge shows higher flows than the downstream gauge.

In order to develop an operating scenario that will allow us to better comply with Article 2 of the requirements for a minimum flow of 152 CFS or inflow, which ever is lower, we plan to adjust our operating procedure on a trial basis over the next 6 months.

- ♦ We will use information from the Athol Corps Gage as an indicator of river flow to manage the operation of the hydroelectric station at New Home Dam.
- ♦ When river flows are at or below 152 CFS at the Athol Corps Gage we will adjust our operating scenario so that the upper pond level will range from  $\frac{1}{2}$ " to  $1\frac{1}{2}$ " above the dam.

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A. DELOACH, JR., O'CONNELL ENERGY GROUP

*[Handwritten signature]*

- When river flows are above 152 CFS we will adjust our operating scenario so that upper pond level will range from  $\frac{1}{2}$ " above the dam crest to  $\frac{1}{4}$ " below the dam. At flows above 160 CFS our station can run continuously at our lowest gate setting and the SCADA system will then follow the fluctuations of the in-flow.

This revision in operating scenario should bring us in compliance with Article 2 which requires a minimum flow of 152 CFS below the New Home Dam Project or inflow when the flow rates drop below 152 CFS. We are in somewhat of a dilemma as to how to read the data that is available for the Millers River flow rates. During low flow rate periods when flow rates are below approximately 200 CFS the Athol Gage shows more water than the Erving Gage, with the Erving Gage being approximately 12 miles downstream from the Athol Gage. As river flows increase the accuracy of the gages seems to improve with Athol and Erving reading similar flow rates even though there must be additional inflows to the Millers River between the gages. Apparently USFWS is using the Erving Gage to show non-compliance with Article 2 and this data at low flow rates is not accurate.

We understand there is an exempted hydroelectric site upstream from us at LP Athol FERC #10163. We are subject to flows coming from LP Athol site FERC #10163 and Starret Company dam, both of which are upstream of our site. Also we have observed river flow gages on the Connecticut River, Chicopee River, Deerfield River and Westfield River and note that major fluctuations are occurring in the flow rates and stages of these rivers. When comparing the river fluctuations on these other rivers in Western Massachusetts where elevations are changing by feet it does not seem the measured affect of approximately 1" at the Erving Gage should be of significant concern.

We have sophisticated computerized equipment installed at this station and all the other sites we operate in Western Massachusetts and have demonstrated to FERC in the past that we have operated the hydroelectric stations with much better control of river flows than a manually operated station could achieve.

The flows passing through the project will be monitored and recorded with our SCADA system to demonstrate compliance with 152 CFS bypass or inflow. Our method is to utilize flow characteristics of our smallest turbine generator, which at 80% gate flows approximately 130 CFS. There is a requirement for 10 CFS to flow through the bypass reach from the dam, which is accomplished through leakage of flash boards at the emergency overflow plus gate leakage at the units that are not operating.

We have not had any correspondence or comments from USFWS regarding our plan other than the initial request on July 25, 2001.



We hope that once you have had a chance to review our response that we could set up a conference call so that we can discuss the accuracy of the gaging information on the Millers River, operation of hydro stations upstream of New Home Dam and USFWS concerns on the operation of this hydroelectric station.

Very truly yours,



Carl A. LeGrand

c: Steve Berry  
NY Regional Office



ORIGINAL

DEERFIELD/MILLERS CHAPTER

FILED  
OFFICE OF THE SECRETARY

10 Old Stage Road  
Wendell, MA 01379

02 MAY -7 PM 3:19

FEDERAL ENERGY  
REGULATORY COMMISSION

Magalie R. Salas, Secretary  
Federal Energy Regulatory Commission  
888 First Street, N.E.  
Washington, DC 20426

Re: Project #6096, New Home Dam

Dear Secretary Salas:

The Deerfield/Millers chapter of Trout Unlimited (TU) offers the following comments regarding the letter dated April 5, 2002 from the O'Connell Energy Group (OEG) to the Federal Energy Regulatory Commission (FERC) concerning compliance with operation conditions at the New Home project.

Although flows in the Millers River below the New Home project varied dramatically during the summer of 2001 (at times over very short periods of time) it is unlikely that this was caused by the drought being experienced in western Massachusetts. By definition, flows are low during a drought and runoff from rainfall (not common in a drought) does not result in discharge into the river in the same volume as during non-drought conditions. Rather the fluctuations observed on the United States Geological Survey's (USGS) flow monitoring gage in Erving, MA (01166500) in the summer of 2001 were anthropogenic. For reasons described later it does not appear that upriver projects were the cause of these fluctuations.

OEG states that when inflow has fallen below 152 cfs their equipment has cycled on and off. This is, by definition, a violation of condition #2 ("instantaneous discharge" of inflow when the river is below 152.7 cfs) of the United States Fish and Wildlife Service's (USFWS) letter dated Nov. 14, 1984, which is referenced as a part of Article 2 of the FERC's order of exemption. Whenever the pond is refilling (hydro cycled off), after being drawdown, inflow does not equal outflow. Inflow equal outflow is the definition of "instantaneous discharge".

The second bullet in the OEG letter, describing proposed operations when the river is below 152 cfs, simply continues the violation of the "instantaneous discharge" component of the USFWS conditions.

OEG describes a contradiction between the United States Army Corps of Engineers (USACOE) gage and the USGS gage in Erving and has decided that it prefers the numbers from the USACOE gage. OEG has stated, without any justification, that the USGS gage is incorrect at low flows. The USGS is the acknowledged expert in the field

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of flow measurement. Their gage is in a free flowing section of the Millers River whereas the USACOE gage is in a flat-water section of the river that appears to be in the backwater of the New Home Project. As stage is equated to discharge, the level of the impoundment behind the New Home dam would then establish a false "discharge" on the USACOE gage, especially at low flows. In Measurement and Computation of Streamflow: Volume 1. Measurement of Stage and Discharge (Geological Survey Water-Supply Paper 2175, 1982) the USGS states that measuring stations should not be set up where the stream is backwatered by other streams, tidal effects, or reservoirs behind dams (pgs. 4-7).

The reverse of the normal discharge relationship (less discharge upriver than down being normal) leads to two conclusions: 1) either there is a stage/discharge relationship problem with one or both gages, or; 2) the USACOE gage is in the backwater of the fluctuating New Home pond. The USACOE gage is maintained by the USGS (personal communication, Jeff Mangum USACOE) but is not calibrated by the USGS. The USGS gage in Erving is calibrated by the USGS. In either of the two above noted cases, the USACOE gage should not be used to assess inflow to the project. A combination of the South Royalston gage (01164000) and the East Branch Tully River gage (01165000) prorated to the drainage area of the New Home dam would provide much more accurate inflow data than a gage in the backwater of the dam or one with inaccurate calibration.

The L.P. Athol project (FERC #10163) is required to operate in a run-of-river mode and thus would not create the peaking hydrograph seen at the USGS gage in Erving in the late summer and fall of 2001. In addition, in a letter to the FERC dated February 28, 2002 the L.P. Athol Corporation states that it did not operate from July 21, 2001 through September 26, 2001, all of October, most of November and much of December. Clearly this project was not responsible for the flow fluctuations recorded by the USGS gage in Erving during the period of reference.

OEG notes fluctuating flows from gages on the Connecticut, Deerfield, Chicopee, and Westfield Rivers. All these rivers are peaking throughout their basin (Deerfield and Connecticut) or peaking at some projects (Westfield and Chicopee). As such they do not represent natural hydrographs or hydrographs of rivers with run-of-river conditions such as the Millers River. Only infrequent flood control operations by the USACOE dams on the East Branch of the Tully or at Birch Hill on the mainstem of the Millers River should cause radical changes in the Millers River. Fluctuations on the above noted rivers are permitted by law or regulation, occur on a regular basis, cannot be related to the Millers River, and do not justify the rapid and repeated fluctuations in the Millers River below the New Home project.

Changes of stage of less than a foot are of concern to TU. For example, on 8/25/01 from 04:00 to 12:00, at the Erving gage the stage changed 2.28" (1.84' to 1.65', 94 to 67 cfs). This is "approximately" 2.25 inches and represents a 28% decrease in flow. This is a dramatic and unnatural change in flow over this short a period. Visual observations of the river when flows fluctuate down are of a significant decrease in wetted area. Changes in flows of this magnitude on this time scale can negatively affect fish, macroinvertebrate



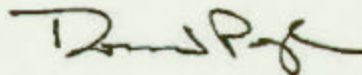
insects, freshwater mussels (two state listed species occur below the New Home project), and other aquatic organisms. Run-of river operations have been required by the USFWS to prevent this type of habitat loss.

There is an apparent contradiction between bullet #3, which states that the station cannot run continuously at flows below 160 cfs and the second to last paragraph on page 2 which seems to state that the smallest turbine will operate at 130 cfs. If a unit can be run at 130 cfs then cycling around 160 cfs would appear to be unnecessary.

The USFWS (letter dated Nov. 14, 1984) requirement for 10 cfs in the bypass reach states that this water must be released at the dam. While it is unclear to TU, from visual observation, that 10 cfs is truly being provided during low flow periods (leakage only conditions at the dam or flashboards along the forebay to the south unit), it is clear that "leakage at the units that are not operating" cannot be a part of the required bypass minimum flow. The end of the tailraces (where leakage through the units enters the river) defines the end of the bypass reach.

Thank you for your consideration of these comments. If you have any questions, I can be reached at the above address or at 413 863 3832 during the day.

Sincerely

A handwritten signature in black ink, appearing to read "Donald Pugh", with a stylized flourish at the end.

Donald Pugh

Cc: Melissa Grader, USFWS  
Diana Shannon, FERC  
Caleb Slater, MADFW  
Carl LeGrand, OEG

FEDERAL ENERGY REGULATORY COMMISSION  
Washington, D. C. 20426

OFFICE OF ENERGY PROJECTS

Project No. 6096-009-Massachusetts  
New Home Dam Project  
O'Connell Energy Group

Mr. Carl LeGrand  
O'Connell Energy Group  
57 Suffolk Street  
Holyoke, MA 01040

JUN 25 2002

RE: Operation of project; Compliance with article 2

Dear Mr. LeGrand:

We received your letter, dated April 5, 2002, regarding operation of the New Home Dam Project, on the Millers River, near Orange, Massachusetts. Article 2 of your exemption requires you to release an instantaneous minimum release of at least 152 cubic feet per second (cfs) below the project, or inflow, whichever is less.

Background

We received information that indicated you were not operating your project as required by article 2. In a letter dated December 10, 2001, we asked you to provide operating records documenting your compliance with the requirements of your exemption during fall 2002. You filed a response to this request on January 9, 2002. In this report, you stated the project uses an automated system that controls turbine operation based upon reservoir elevation and therefore, you did not have project discharge records, only reservoir elevation data. You also provided data from the U.S. Army Corps of Engineers streamflow gage (Corps gage) about 5 miles upstream documenting that inflows to your project vary due to upstream manipulation.

By letter dated February 12, 2002, we concluded that it is unlikely you operated your project in compliance with article 2, however, we were unable to determine your compliance based on the data you provided and requested that you file a streamflow compliance monitoring plan. Your April 5, 2002 letter was filed in response to this request.

0207020109-3

FERC DOCKETED



### Compliance Plan

According to your plan, when inflows are at or below 152 cfs (as measured at the Corps gage) you propose to operate so that the upper reservoir elevation ranges from 0.5-1.5 inches above the dam crest. When inflow exceeds 152 cfs (again, as measured at the Corps gage), you plan to operate the project so that the upper reservoir level ranges from 0.5 inches above to 0.5 inches below the dam crest.

In your filing, you question the accuracy of the Corps gage, in addition to the USGS gage at Erving (Gage No. 01166500),<sup>1</sup> during low flows since flows are measurably higher at the Athol gage than at the USGS gage at Erving. You note there are other operators upstream of your project, including another Commission-exempted project (Cresticon Project, FERC No. 10163) and a non-jurisdictional project (Starret Company Dam). You suggest that fluctuations on other rivers are much greater than that observed on the Millers River.

We note that Trout Unlimited (TU) commented on your proposal by undated letter, filed with the Commission on May 7, 2002. The TU suggests that downstream fluctuations observed at the Erving gage result from operation of your Project. The TU suggests that operation of the project is in violation of article 2, specifically when the pond is refilling after your units go off-line and flows downstream of the project cease. The TU feels that your proposal for continued operation will not provide for compliance of article 2. The TU remains concerned about the changes in fluctuations observed at the Erving gage and stated that such fluctuations could result in significant decreases in wetted area causing adverse impacts to fish, macroinvertebrates, and mussels.

### Conference Call

On April 25, 2002, Commission staff talked with you and the U.S. Fish and Wildlife Service (FWS) regarding your proposed operating regime and the fluctuations observed both upstream and downstream of your project.<sup>2</sup> You stated that since August 2001, you have modified your operations in efforts to minimize fluctuations downstream of your project. You provided a description of your units and general information on how the project is operated.

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<sup>1</sup>Located approximately seven miles downstream of the project.

<sup>2</sup>Phone conversation between Diana Shannon (Commission staff), Melissa Grader (representing the FWS), and Carl LeGrand and Steve Berry, representing the exemptee on April 25, 2002.



On the south side, there are two units (with a combined minimum hydraulic capacity of 100-120 cfs; maximum capacity of 250-270 cfs). On the north side, there is only one unit (the largest unit at the project, with a minimum hydraulic capacity of 160 cfs). You stated this north side unit is not capable of remote operation and must be manually brought on-line. However, it is also tied to reservoir elevation and the unit will go off-line automatically with a decreasing reservoir elevation, to prevent excessive drawdown of the project reservoir.

You provided (via fax) a graph of flow measured at the upstream Corps gage and the USGS gage at Erving for August 24-September 1, 2001. In our phone conversation, you noted that when your project was off-line (August 29 through September 1), fluctuations were still observed at the upstream gage (but not observed downstream), indicating no backwatering effects at this gage of your project's reservoir. The FWS and Commission staff noted the data also suggested that fluctuations at the downstream gage were likely the result of your project's operation.

We also discussed the difference in flow magnitude between the two gages, specifically that inflows were approximately 40-100 cfs higher than flows measured at the USGS Erving gage (the reason for this difference is unknown). Commission staff agreed to contact the Corps to discuss the accuracy of its gage.

#### Discussion and Conclusion

Commission staff contacted Corps and USGS staff regarding the accuracy of the upstream Corps gage. We found that the gage has not been rated since 1990, and maintenance of the gage is performed only on an as-needed basis. No measurements to update or verify the rating curve have been taken or are planned in the future.

Based on this, your proposal to use this gage (in determining when project inflow is at or below 152 cfs) to determine when to modify your set points is not acceptable. Based on our discussion, you have a sound working knowledge of generation as it relates to flow through your units. Therefore, we believe you can accurately estimate project discharge via generation records. If investigations of compliance with article 2 arise in the future, estimates of project discharge based on project generation could be used to determine compliance. We also conclude you are able to determine when project discharge approaches the required discharge of 152 cfs. Therefore, use of the Corps gage upstream of your project, as you proposed, appears unnecessary.


If your reservoir elevation is below the crest of the dam when your units go off-line and there is no flow being released from your project (except the 10 cfs being

released into the bypassed reach as required by article 2),<sup>3</sup> you are operating your project in violation of article 2. Article 2 requires that 152 cfs, or inflow, be released from the project. If you determine that you cannot operate the project as required by your exemption, you may apply for amendment of article 2. Any amendment request will require agreement with the state and federal fish and wildlife agencies.

As discussed above, we conclude you have the ability to estimate flow releases at the project based upon generation. Any future requests for information by Commission staff should include your estimates of discharge through the powerhouse, in addition to generation and reservoir elevations. This information should be sufficient to determine your compliance with article 2. If minimum flow compliance problems arise in the future, additional gaging below the project may be necessary.

Thank you for your cooperation. If you have any questions, please contact Diana Shannon at (202) 208-7774.

Sincerely,



George H. Taylor  
Chief, Biological Resources Branch  
Division of Hydropower Administration  
and Compliance

cc: Ms. Melissa Grader  
U.S. Fish and Wildlife Service  
70 Commercial Street, Suite 300  
Concord, NH 03301

Mr. Donald Pugh  
Trout Unlimited  
10 Old Stage Road  
Wendell, MA 01379

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<sup>3</sup> Assuming inflow is greater than 10 cfs. One alternative to release greater flow at the dam is modifying your gate settings. The project has two 2 bascule gates with dimensions of 5 feet by 40 feet. Given the size of the gates at the project, we assume that for this magnitude of flow, gate manipulation is infeasible.

## **APPENDIX C: Water Withdrawal Spreadsheets**

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**Public Water Supply Annual Statistical Report**Facility: **Ashburnham Water Department**Town: **Ashburnham, Massachusetts**PWS ID#: **2011000****ALL Units are in MG*****Water Production and Consumptive Summary:*****1993**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	5.1883			5.1883
Feb	4.8647			4.8647
Mar	4.8769			4.8769
Apr	5.2067			5.2067
May	6.7016			6.7016
Jun	7.9368			7.9368
Jul	7.8374			7.8374
Aug	6.8613			6.8613
Sep	6.7006			6.7006
Oct	6.0016			6.0016
Nov	5.8689			5.8689
Dec	5.5295			5.5295
Total	73.5743	0	0	73.5743

**1996**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	6.1111			6.1111
Feb	5.6643			5.6643
Mar	5.4409			5.4409
Apr	6.2487			6.2487
May	6.9154			6.9154
Jun	7.1967			7.1967
Jul	7.1541			7.1541
Aug	9.0745			9.0745
Sep	7.3258			7.3258
Oct	6.3564			6.3564
Nov	6.3408			6.3408
Dec	6.92			6.92
Total	80.7487	0	0	80.7487

**1994**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	5.8317			5.8317
Feb	5.3778			5.3778
Mar	6.1466			6.1466
Apr	6.0475			6.0475
May	6.543			6.543
Jun	8.4469			8.4469
Jul	8.9829			8.9829
Aug	7.2557			7.2557
Sep	6.5268			6.5268
Oct	7.0217			7.0217
Nov	6.1231			6.1231
Dec	5.8958			5.8958
Total	80.1995	0	0	80.1995

**1997**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	8.309			8.309
Feb	7.7505			7.7505
Mar	8.1358			8.1358
Apr	8.2596			8.2596
May	8.8298			8.8298
Jun	10.4626			10.4626
Jul	9.9134			9.9134
Aug	9.0131			9.0131
Sep	8.1113			8.1113
Oct	8.4772			8.4772
Nov	8.5978			8.5978
Dec	6.0501			6.0501
Total	101.9102	0	0	101.9102

**1995**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	5.6836			5.6836
Feb	5.4737			5.4737
Mar	6.3322			6.3322
Apr	6.1311			6.1311
May	6.9862			6.9862
Jun	7.1989			7.1989
Jul	8.994			8.994
Aug	8.1981			8.1981
Sep	6.2305			6.2305
Oct	6.4126			6.4126
Nov	6.3594			6.3594
Dec	5.8795			5.8795
Total	79.8798	0	0	79.8798

**1998**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	6.3614			6.3614
Feb	5.3108			5.3108
Mar	5.8138			5.8138
Apr	6.0829			6.0829
May	7.8578			7.8578
Jun	6.1877			6.1877
Jul	7.9799			7.9799
Aug	8.7105			8.7105
Sep	7.3702			7.3702
Oct	7.2037			7.2037
Nov	6.4489			6.4489
Dec	6.3927			6.3927
Total	81.7203	0	0	81.7203



**Public Water Supply Annual Statistical Report****Facility: Ashburnham Water Department****Town: Ashburnham, Massachusetts****PWS ID#: 2011000****1999**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	7.5912			7.5912
Feb	6.4011			6.4011
Mar	6.8651			6.8651
Apr	6.8189			6.8189
May	8.5668			8.5668
Jun	9.4781			9.4781
Jul	8.6633			8.6633
Aug	9.8398			9.8398
Sep	7.9632			7.9632
Oct	7.263			7.263
Nov	5.866			5.866
Dec	6.0232			6.0232
Total	91.3397	0	0	91.3397

**2000**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	6.1087			6.1087
Feb	6.2807			6.2807
Mar	6.1376			6.1376
Apr	5.7174			5.7174
May	6.6599			6.6599
Jun	5.8339			5.8339
Jul	6.7709			6.7709
Aug	5.9022			5.9022
Sep	7.2952			7.2952
Oct	6.66			6.66
Nov	6.9069			6.9069
Dec	7.5084			7.5084
Total	77.7818	0	0	77.7818

**Average**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	6.3981			6.3981
Feb	5.8905			5.8905
Mar	6.2186			6.2186
Apr	6.3141			6.3141
May	7.3826			7.3826
Jun	7.8427			7.8427
Jul	8.2870			8.2870
Aug	8.1069			8.1069
Sep	7.1905			7.1905
Oct	6.9245			6.9245
Nov	6.5640			6.5640
Dec	6.2749			6.2749
Total	83.3943			83.3943



**Public Water Supply Annual Statistical Report****Facility: Winchendon Water Department****Town: Winchendon, Massachusetts****PWS ID#: 2343000****ALL Units are in MG****Water Production and Consumptive Summary:****1993**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	19.9135			
Feb	16.3188			
Mar	18.6437			
Apr	17.5579			
May	19.3957			
Jun	19.4243			
Jul	24.7833			
Aug	19.2902			
Sep	19.3319			
Oct	21.4509			
Nov	18.6303			
Dec	21.6581			
Total	236.3986	0	25.520264	210.878336

**1996**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	31.8409			
Feb	31.1387			
Mar	32.1728			
Apr	31.6549			
May	33.5846			
Jun	37.6833			
Jul	38.7333			
Aug	42.0733			
Sep	36.9933			
Oct	34.8618			
Nov	31.8884			
Dec	36.3588			
Total	418.9841	0	28.92516	390.05894

**1994**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	33.123			
Feb	36.243			
Mar	36.4342			
Apr	32.2101			
May	35.2112			
Jun	38.6988			
Jul	41.9224			
Aug	39.2464			
Sep	34.7108			
Oct	36.3683			
Nov	36.4592			
Dec	33.3736			
Total	434.001	0	25.407316	408.593684

**1997**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	33.3137			
Feb	31.9988			
Mar	31.3134			
Apr	33.0191			
May	33.6974			
Jun	38.591			
Jul	37.5915			
Aug	36.0746			
Sep	31.3086			
Oct	29.9305			
Nov	29.0032			
Dec	28.3033			
Total	394.1451	0	24.75506	369.39004

**1995**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	34.4153			
Feb	30.8278			
Mar	34.0134			
Apr	32.5101			
May	35.1738			
Jun	36.2827			
Jul	43.0798			
Aug	41.5729			
Sep	36.5793			
Oct	32.4357			
Nov	25.5932			
Dec	30.5399			
Total	413.0239	0	27.557068	385.466832

**1998**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	28.6468			
Feb	27.3479			
Mar	30.7232			
Apr	29.0763			
May	33.1781			
Jun	29.7804			
Jul	36.9895			
Aug	39.1372			
Sep	32.957			
Oct	31.9191			
Nov	28.5034			
Dec	29.2635			
Total	377.5224	0	27.996892	349.525508

**Public Water Supply Annual Statistical Report****Facility: Winchendon Water Department****Town: Winchendon, Massachusetts****PWS ID#: 2343000****1999**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	30.1688			
Feb	29.8104			
Mar	31.4202			
Apr	29.9404			
May	38.4589			
Jun	29.7804			
Jul	36.1918			
Aug	34.9323			
Sep	29.3039			
Oct	29.675			
Nov	28.4088			
Dec	28.3725			
Total	376.4634	0	28.568	347.8954

**2000**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	29.1727			
Feb	29.4369			
Mar	31.0725			
Apr	30.5817			
May	35.8201			
Jun	33.8502			
Jul	37.3908			
Aug	33.9743			
Sep	33.5116			
Oct	31.3446			
Nov	29.5326			
Dec	31.0306			
Total	386.7186	0	25.442472	361.276128

**Average**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	30.0743			
Feb	29.1403			
Mar	30.7242			
Apr	29.5688			
May	33.0650			
Jun	33.0114			
Jul	37.0853			
Aug	35.7877			
Sep	31.8371			
Oct	30.9982			
Nov	28.5024			
Dec	29.8625			
Total	379.6571	0.0000	26.4639	353.1933

**Public Water Supply Annual Statistical Report**Facility: **Gardner DPW-Water Division**Town: **Gardner, Massachusetts**PWS ID#: **2103000****ALL Units are in MG*****Water Production and Consumptive Summary:*****1993**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	53.935			53.935
Feb	50.269			50.269
Mar	55.885			55.885
Apr	55.458			55.458
May	63.79			63.79
Jun	62.847			62.847
Jul	68.28			68.28
Aug	60.716			60.716
Sep	55.989			55.989
Oct	57.537			57.537
Nov	56.031			56.031
Dec	55.969			55.969
Total	696.706	0	0	696.706

**1994**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	60.7679			60.7679
Feb	53.978			53.978
Mar	61.062			61.062
Apr	57.874			57.874
May	63.383			63.383
Jun	64.973			64.973
Jul	65.983			65.983
Aug	60.283			60.283
Sep	58.937			58.937
Oct	63.229			63.229
Nov	56.441			56.441
Dec	58.654			58.654
Total	725.5649	0	0	725.5649

**1995**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	59.712			59.712
Feb	52.723			52.723
Mar	58.411			58.411
Apr	57.301			57.301
May	60.995			60.995
Jun	61.627			61.627
Jul	70.312			70.312
Aug	77.888			77.888
Sep	62.881			62.881
Oct	61.835			61.835
Nov	58.508			58.508
Dec	60.145			60.145
Total	742.338	0	0	742.338

**1996**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	61.879			61.879
Feb	55.69			55.69
Mar	55.156			55.156
Apr	64.477			64.477
May	63.06			63.06
Jun	65.087			65.087
Jul	68.42			68.42
Aug	68.283			68.283
Sep	69.323			69.323
Oct	63.437			63.437
Nov	57.26			57.26
Dec	61.531			61.531
Total	753.603	0	0	753.603

**1997**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	61.572			61.572
Feb	56.008			56.008
Mar	62.404			62.404
Apr	66.73			66.73
May	69.94			69.94
Jun	79.685			79.685
Jul	77.069			77.069
Aug	72.67			72.67
Sep	68.322			68.322
Oct	63.524			63.524
Nov	59.871			59.871
Dec	63.826			63.826
Total	801.621	0	0	801.621

**1998**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	62.1737			62.1737
Feb	56.9028			56.9028
Mar	62.9918			62.9918
Apr	63.2852			63.2852
May	69.7979			69.7979
Jun	67.418			67.418
Jul	78.251			78.251
Aug	76.3913			76.3913
Sep	68.9169			68.9169
Oct	72.174			72.174
Nov	69.0591			69.0591
Dec	64.4482			64.4482
Total	811.8099	0	0	811.8099

**Public Water Supply Annual Statistical Report****Facility: Gardner DPW-Water Division****Town: Gardner, Massachusetts****PWS ID#: 2103000****1999**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	69			69
Feb	60			60
Mar	65			65
Apr	72			72
May	78			78
Jun	94			94
Jul	89			89
Aug	79			79
Sep	70			70
Oct	71			71
Nov	66			66
Dec	62			62
Total	875	0	0	875

**2000**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	62			62
Feb	63			63
Mar	63			63
Apr	62			62
May	60.5			60.5
Jun	63			63
Jul	65			65
Aug	71			71
Sep	60			60
Oct	57			57
Nov	54			54
Dec	57			57
Total	737.5	0	0	737.5

**Average**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	61.3800			61.3800
Feb	56.0714			56.0714
Mar	60.4887			60.4887
Apr	62.3907			62.3907
May	66.1832			66.1832
Jun	69.8296			69.8296
Jul	72.7894			72.7894
Aug	70.7789			70.7789
Sep	64.2961			64.2961
Oct	63.7170			63.7170
Nov	59.6463			59.6463
Dec	60.4467			60.4467
Total	768.0179	0.0000	0.0000	768.0179

**Public Water Supply Annual Statistical Report**Facility: **Westminster Water Department**Town: **Westminster, Massachusetts**PWS ID#: **2332000****ALL Units are in MG****Water Production and Consumptive Summary:****1993**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan		9.854		
Feb		9.65		
Mar		10.883		
Apr		10.945		
May		11.45		
Jun		13.615		
Jul		13.666		
Aug		11.8		
Sep		9.76		
Oct		9.571		
Nov		9.569		
Dec		9.492		
Total	0	130.255	3.71697	126.53803

**1996**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan		8.303		8.303
Feb		7.935		7.935
Mar		8.65		8.65
Apr		8.794		8.794
May		9.727		9.727
Jun		10.17		10.17
Jul		10.688		10.688
Aug		11.657		11.657
Sep		9.456		9.456
Oct		8.764		8.764
Nov		8.25		8.25
Dec		8.486		8.486
Total	0	110.88	3.52201	107.35799

**1994**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan		9.439		
Feb		9.095		
Mar		11.361		
Apr		10.675		
May		11.752		
Jun		12.789		
Jul		13.394		
Aug		12.862		
Sep		10.908		
Oct		11.686		
Nov		10.126		
Dec		9.764		
Total	0	133.851	3.79672	130.05428

**1997**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan		8.595		8.595
Feb		7.676		7.676
Mar		8.488		8.488
Apr		8.495		8.495
May		9.21		9.21
Jun		12.302		12.302
Jul		11.879		11.879
Aug		10.304		10.304
Sep		8.79		8.79
Oct		8.131		8.131
Nov		6.655		6.655
Dec		6.571		6.571
Total	0	107.096	3.862334	103.233666

**1995**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan		10.182		10.182
Feb		9.007		9.007
Mar		10.199		10.199
Apr		10.114		10.114
May		10.234		10.234
Jun		11.828		11.828
Jul		12.24		12.24
Aug		12.172		12.172
Sep		10.584		10.584
Oct		9.301		9.301
Nov		8.245		8.245
Dec		8.061		8.061
Total	0	122.167	3.73104	118.43596

**1998**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan		6.5		6.5
Feb		5.777		5.777
Mar		6.573		6.573
Apr		6.9697		6.9697
May		8.2382		8.2382
Jun		7.7337		7.7337
Jul		10.4306		10.4306
Aug		10.7625		10.7625
Sep		9.0133		9.0133
Oct		8.0897		8.0897
Nov		6.7866		6.7866
Dec		6.6549		6.6549
Total	0	93.5292	4.2133	89.3159

**Public Water Supply Annual Statistical Report****Facility: Westminster Water Department****Town: Westminster, Massachusetts****PWS ID#: 2332000****1999**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan		7.8006		
Feb		5.9593		
Mar		6.8639		
Apr		7.0106		
May		7.9186		
Jun		11.7285		
Jul		9.7569		
Aug		8.4633		
Sep		6.3584		
Oct		6.2237		
Nov		5.9642		
Dec		5.381		
Total	0	89.429	5.10246	84.32654

**2000**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan		5.4928		5.4928
Feb		4.8442		4.8442
Mar		5.3772		5.3772
Apr		5.4104		5.4104
May		6.3539		6.3539
Jun		6.136		6.136
Jul		7.9754		7.9754
Aug		8.1903		8.1903
Sep		7.8519		7.8519
Oct		7.609		7.609
Nov		7.0119		7.0119
Dec		6.9827		6.9827
Total	0	79.2357	4.26609	74.96961

**Average**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan		8.2708		7.8146
Feb		7.4929		7.0478
Mar		8.5494		7.8574
Apr		8.5517		7.9566
May		9.3605		8.7526
Jun		10.7878		9.6339
Jul		11.2537		10.6426
Aug		10.7764		10.6172
Sep		9.0902		9.1390
Oct		8.6719		8.3789
Nov		7.8260		7.3897
Dec		7.6741		7.3511
Total	0.0000	108.3054	4.0264	104.2790

**Public Water Supply Annual Statistical Report**Facility: **Templeton Water Department**Town: **Templeton, Massachusetts**PWS ID#: **2294000****ALL Units are in MG*****Water Production and Consumptive Summary:*****1993**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	19.332			19.332
Feb	19.172			19.172
Mar	22.78			22.78
Apr	20.025			20.025
May	24.588			24.588
Jun	27.319			27.319
Jul	28.295			28.295
Aug	22.976			22.976
Sep	22.135			22.135
Oct	21.521			21.521
Nov	22.545			22.545
Dec	24.024			24.024
Total	274.712	0	0	274.712

**1996**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	22.534			22.534
Feb	20.515			20.515
Mar	22.374			22.374
Apr	21.245			21.245
May	23.769			23.769
Jun	25.132			25.132
Jul	25.085			25.085
Aug	26.404			26.404
Sep	23.837			23.837
Oct	26.146			26.146
Nov	25.843			25.843
Dec	27.58			27.58
Total	290.464	0	0	290.464

**1994**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	26.171			26.171
Feb	23.733			23.733
Mar	24.628			24.628
Apr	21.538			21.538
May	23.54			23.54
Jun	25.976			25.976
Jul	26.689			26.689
Aug	25.276			25.276
Sep	24.148			24.148
Oct	23.547			23.547
Nov	20.834			20.834
Dec	21.914			21.914
Total	287.994	0	0	287.994

**1997**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	26.136			26.136
Feb	22.598			22.598
Mar	25.234			25.234
Apr	26.431			26.431
May	28.227			28.227
Jun	30.645			30.645
Jul	24.372			24.372
Aug	22.552			22.552
Sep	23.394			23.394
Oct	21.993			21.993
Nov	21.321			21.321
Dec	22.772			22.772
Total	295.675	0	0	295.675

**1995**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	22.202			22.202
Feb	21.868			21.868
Mar	24.602			24.602
Apr	20.354			20.354
May	23.875			23.875
Jun	24.697			24.697
Jul	24.206			24.206
Aug	26.46			26.46
Sep	24.226			24.226
Oct	22.25			22.25
Nov	20.2			20.2
Dec	21.112			21.112
Total	276.052	0	0	276.052

**1998**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	23.359			23.359
Feb	18.43			18.43
Mar	21.893			21.893
Apr	20.804			20.804
May	22.121			22.121
Jun	21.713			21.713
Jul	22.808			22.808
Aug	22.62			22.62
Sep	19.521			19.521
Oct	18.6			18.6
Nov	18.29			18.29
Dec	17.768			17.768
Total	247.927	0	0	247.927

**Public Water Supply Annual Statistical Report****Facility: Templeton Water Department****Town: Templeton, Massachusetts****PWS ID#: 2294000****1999**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	17.322			17.322
Feb	15.811			15.811
Mar	17.428			17.428
Apr	15.061			15.061
May	17.34			17.34
Jun	18.244			18.244
Jul	16.426			16.426
Aug	14.259			14.259
Sep	9.131			9.131
Oct	7.554			7.554
Nov	11.89			11.89
Dec	13.955			13.955
Total	174.421	0	0	174.421

**2000**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	14.225			14.225
Feb	12.588			12.588
Mar	19.632			19.632
Apr	13.571			13.571
May	16.051			16.051
Jun	15.299			15.299
Jul	15.99			15.99
Aug	14.44			14.44
Sep	14.117			14.117
Oct	10.189			10.189
Nov	13.645			13.645
Dec	14.526			14.526
Total	174.273	0	0	174.273

**Average**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	21.4101			21.4101
Feb	19.3394			19.3394
Mar	22.3214			22.3214
Apr	19.8786			19.8786
May	22.4389			22.4389
Jun	23.6281			23.6281
Jul	22.9839			22.9839
Aug	21.8734			21.8734
Sep	20.0636			20.0636
Oct	18.9750			18.9750
Nov	19.3210			19.3210
Dec	20.4564			20.4564
Total	252.6898	0.0000	0.0000	252.6898



**Water Management Act (WMA) Annual Statistical Report****Facility: Seaman Paper Company****Town: Otter River Basin****WMA #: 2-07-294.02****ALL Units are in MG*****Water Production and Consumptive Summary:*****1993**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	28.94392			28.94392
Feb	26.570116			26.570116
Mar	31.427467			31.427467
Apr	27.709792			27.709792
May	29.189712			29.189712
Jun	27.664396			27.664396
Jul	28.681721			28.681721
Aug	29.195834			29.195834
Sep	29.767227			29.767227
Oct	31.946223			31.946223
Nov	29.31601			29.31601
Dec	29.19512			29.19512
Total	349.607538	0	0	349.607538

**1996**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	33.299			33.299
Feb	29.898			29.898
Mar	32.42			32.42
Apr	31.401			31.401
May	35.606			35.606
Jun	35.133			35.133
Jul	33.249			33.249
Aug	32.106			32.106
Sep	28.786			28.786
Oct	33.841			33.841
Nov	31.071			31.071
Dec	29.366			29.366
Total	386.176	0	0	386.176

**1994**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	31.75516			31.75516
Feb	28.269904			28.269904
Mar	29.800275			29.800275
Apr	28.601231			28.601231
May	29.622532			29.622532
Jun	28.559842			28.559842
Jul	28.076552			28.076552
Aug	28.62665			28.62665
Sep	28.711802			28.711802
Oct	27.749161			27.749161
Nov	26.719099			26.719099
Dec	28.471377			28.471377
Total	344.963585	0	0	344.963585

**1997**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	36.386			36.386
Feb	30.903			30.903
Mar	33.887			33.887
Apr	32.534			32.534
May	32.657			32.657
Jun	33.516			33.516
Jul	31.889			31.889
Aug	33.613			33.613
Sep	34.226			34.226
Oct	36.178			36.178
Nov	32.95			32.95
Dec	29.967			29.967
Total	398.706	0	0	398.706

**1995**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	29.857821			29.857821
Feb	28.323807			28.323807
Mar	32.407856			32.407856
Apr	31.318982			31.318982
May	32.133798			32.133798
Jun	29.126738			29.126738
Jul	31.841007			31.841007
Aug	32.580215			32.580215
Sep	33.857289			33.857289
Oct	34.355372			34.355372
Nov	30.041722			30.041722
Dec	31.889937			31.889937
Total	377.734544	0	0	377.734544

**1998**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	35.074			35.074
Feb	32.969			32.969
Mar	29.795			29.795
Apr	33.831			33.831
May	32.963			32.963
Jun	31.984			31.984
Jul	33.388			33.388
Aug	32.938			32.938
Sep	33.173			33.173
Oct	29.819			29.819
Nov	34.233			34.233
Dec	30.995			30.995
Total	391.162	0	0	391.162

**Water Mangement Act (WMA) Annual Statistical Report****Facility: Seaman Paper Company****Town: Otter River Basin****WMA #: 2-07-294.02****1999**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	31.407			31.407
Feb	35.402			35.402
Mar	31.699			31.699
Apr	32.465			32.465
May	31.619			31.619
Jun	32.709			32.709
Jul	34.155			34.155
Aug	30.973			30.973
Sep	32.177			32.177
Oct	31.436			31.436
Nov	33.017			33.017
Dec	37.445			37.445
Total	394.504	0	0	394.504

**2000**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan				0
Feb				0
Mar				0
Apr				0
May				0
Jun				0
Jul				0
Aug				0
Sep				0
Oct				0
Nov				0
Dec				0
Total	0	0	0	0

Average (only for those periods when withdrawals occurred)

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	32.3890			28.3404
Feb	30.3337			26.5420
Mar	31.6338			27.6796
Apr	31.1230			27.2326
May	31.9701			27.9739
Jun	31.2419			27.3366
Jul	31.6115			27.6600
Aug	31.4332			27.5041
Sep	31.5283			27.5873
Oct	32.1893			28.1656
Nov	31.0497			27.1685
Dec	31.0471			27.1662
Total	377.5505			330.3567

**Water Mangement Act (WMA) Annual Statistical Report**  
**Facility: American Tissue Mills of Massachusetts, Inc.**  
**Town: Baldwinville, Massachusetts**  
**WMA #: 10709101**

**ALL Units are in MG**

***Water Production and Consumptive Summary:***

**1994**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	54.28			54.28
Feb	38.51			38.51
Mar	60.78			60.78
Apr	58.43			58.43
May	56.92			56.92
Jun	58.81			58.81
Jul	69.99			69.99
Aug	73.7			73.7
Sep	76.76			76.76
Oct	58.04			58.04
Nov	65.4			65.4
Dec	71.07			71.07
Total	742.69	0	0	742.69

**Average (only for those periods when withdrawals occurred)**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	70.035			17.50875
Feb	58.645			14.66125
Mar	70.04			17.51
Apr	64.965			16.24125
May	65.73			16.4325
Jun	54.93			13.7325
Jul	45.005			11.25125
Aug	66.025			16.50625
Sep	80.745			20.18625
Oct	51.34			12.835
Nov	46.565			11.64125
Dec	48.925			12.23125
Total	722.95			180.7375

**1995**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	85.79			85.79
Feb	78.78			78.78
Mar	79.3			79.3
Apr	71.5			71.5
May	74.54			74.54
Jun	51.05			51.05
Jul	20.02			20.02
Aug	58.35			58.35
Sep	84.73			84.73
Oct	44.64			44.64
Nov	27.73			27.73
Dec	26.78			26.78
Total	703.21	0	0	703.21

# Public Water Supply Annual Statistical Report

Facility: Town of Athol-Water Division

Town: Athol

PWS ID#: 2015000

**ALL Units are in MG**

## Water Production and Consumptive Summary:

1995

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	25.7719		0.177276	25.594624
Feb	25.4528		0.248336	25.204464
Mar	26.969106		0.21318	26.755926
Apr	25.3113		0.215424	25.095876
May	26.05357		0.317152	25.736418
Jun	28.16191		0.374748	27.787162
Jul	29.14234		0.374748	28.767592
Aug	30.2732		0.449548	29.823652
Sep	27.0239		0.307428	26.716472
Oct	27.7934		0.315656	27.477744
Nov	26.593		0.28424	26.30876
Dec	26.853		0.289476	26.563524
Total	325.399426	0	3.567212	321.832214

1996

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	26.261		0.334356	25.926644
Feb	23.655		0.270776	23.384224
Mar	25.321		0.279752	25.041248
Apr	25.326		0.300696	25.025304
May	29.504		0.480216	29.023784
Jun	31.058		0.513876	30.544124
Jul	31.85		0.513876	31.336124
Aug	32.652		0.985864	31.666136
Sep	27.285		0.834768	26.450232
Oct	25.202		0.608872	24.593128
Nov	24.572		0.278256	24.293744
Dec	25.305		0.181016	25.123984
Total	327.991	0	5.582324	322.408676

1997

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	26.842		0.196724	26.645276
Feb	22.605		0.210936	22.394064
Mar	24.131		0.189244	23.941756
Apr	24.138		0.166056	23.971944
May	28.579		0.223652	28.355348
Jun	34.104		0.216172	33.887828
Jul	32.636		0.41888	32.21712
Aug	29.32		0.457776	28.862224
Sep	26.099		0.272272	25.826728
Oct	24.933		0.192236	24.740764
Nov	23.484		0.210188	23.273812
Dec	19.975		0.16082	19.81418
Total	316.846	0	2.914956	313.931044

1998

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	26.916		0.185504	26.730496
Feb	23.835		0.17578	23.65922
Mar	26.989		0.170544	26.818456
Apr	27.485		0.237116	27.247884
May	32.105		0.26554	31.83946
Jun	28.942		0.346324	28.595676
Jul	31.379		0.37774	31.00126
Aug	33.459257		0.308176	33.151081
Sep	32.264833		0.333608	31.931225
Oct	28.772473		0.174284	28.598189
Nov	25.43337		0.163064	25.270306
Dec	29.841275		0.21318	29.628095
Total	347.422208	0	2.95086	344.471348

1999

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	32.588001		0.414	21.813001
Feb	26.981035		0.1545	26.826535
Mar	25.824337		0.21525	25.609087
Apr	25.525467		0.177	25.348467
May	31.276941		0.291	30.985941
Jun	37.206559		0.60525	36.601309
Jul	33.275717		0.32925	32.946467
Aug	32.265923		0.3345	31.931423
Sep	29.623608		0.24225	29.381358
Oct	27.156906		0.168	26.988906
Nov	25.675858		0.177	25.498858
Dec	26.990894		0.18075	26.810144
Total	354.391246	0	3.28875	341.119028

2000

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	27.091646		0.219164	26.872482
Feb	26.760617		0.157828	26.602789
Mar	27.843874		0.206448	27.637426
Apr	26.471663		0.187748	26.283915
May	27.570324		0.268532	27.301792
Jun	27.347502		0.230384	27.117118
Jul	27.25618		0.283492	26.972688
Aug	25.687762		0.25058	25.437182
Sep	23.228153		0.18326	23.044893
Oct	23.932304		0.17204	23.760264
Nov	22.269975		0.189992	22.079983
Dec	23.400561		0.184008	23.216553
Total	308.860561	0	2.533476	306.327085

# Public Water Supply Annual Statistical Report

Facility: Town of Athol-Water Division

Town: Athol

PWS ID#: 2015000

Average (only for those periods when withdrawals occurred)

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	27.5784		0.2545	25.5971
Feb	24.8816		0.2030	24.6785
Mar	26.1797		0.2124	25.9673
Apr	25.7096		0.2140	25.5585
May	29.1815		0.3077	28.8738
Jun	31.1367		0.3811	30.7555
Jul	30.9232		0.3830	30.5402
Aug	30.6097		0.4644	30.1453
Sep	27.5874		0.3623	27.2252
Oct	26.2983		0.2718	26.0265
Nov	24.6714		0.2171	24.4542
Dec	25.3943		0.2015	25.1927
Total	330.1517		3.4729	325.0149

# Public Water Supply Annual Statistical Report

Facility: Orange Water Department

Town: Orange, Massachusetts

PWS ID#: 1223000

**ALL Units are in MG**

## Water Production and Consumptive Summary:

1993

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	22.83325	0.53108		23.36433
Feb	20.289776	0.322388		20.612164
Mar	22.174968	0.42636		22.601328
Apr	20.0125	0.549032		20.561532
May	20.8037	0.399432		21.203132
Jun	20.7958	0.502656		21.298456
Jul	23.345729	0.716584		24.062313
Aug	19.7527	0.7667		20.5194
Sep	19.459002	0.753984		20.212986
Oct	17.5409	0.176528		17.717428
Nov	17.0048	0.525096		17.529896
Dec	19.534203	0.608872		20.143075
Total	243.547328	6.278712	0	249.82604

1996

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	19.3657	0.334356		19.700056
Feb	17.8853	0.270776		18.156076
Mar	18.5762	0.279752		18.855952
Apr	18.522391	0.300696		18.823087
May	19.7419	0.480216		20.222116
Jun	19.3934	0.513876		19.907276
Jul	18.976511	0.985864		19.962375
Aug	20.0815	0.834768		20.916268
Sep	19.5718	0.608872		20.180672
Oct	17.3676	0.278256		17.645856
Nov	18.1729	0.181016		18.353916
Dec	20.073185	0.196724		20.269909
Total	227.728387	5.265172	0	232.993559

1994

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	19.89975	0.60588		20.50563
Feb	18.0399	0.563992		18.603892
Mar	19.5631	0.587928		20.151028
Apr	17.8548	0.59466		18.44946
May	19.8584	0.596156		20.454556
Jun	20.4915	0.66946		21.16096
Jul	19.5075	0.3366		19.8441
Aug	18.0006	0.256564		18.257164
Sep	15.8783	0.262548		16.140848
Oct	14.0912	0.227392		14.318592
Nov	17.2359	0.184756		17.420656
Dec	17.8927	0.154836		18.047536
Total	218.31365	5.040772	0	223.354422

1997

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	18.915	0.196724		19.111724
Feb	23.652391	0.210936		23.863327
Mar	28.0393	0.189244		28.228544
Apr	17.5496	0.223652		17.773252
May	18.9313	0.216172		19.147472
Jun	22.3001	0.41888		22.71898
Jul	22.2767	0.457776		22.734476
Aug	21.1727	0.27302		21.44572
Sep	19.5739	0.192236		19.766136
Oct	19.5542	0.210188		19.764388
Nov	18.2165	0.16082		18.37732
Dec	18.4883	0.210188		18.698488
Total	248.669991	2.959836	0	251.629827

1995

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	19.1107	0.154836		19.265536
Feb	18.847655	0.177276		19.024931
Mar	20.82653	0.248346		21.074876
Apr	20.0962	0.21318		20.30938
May	21.534154	0.215424		21.749578
Jun	20.755095	0.317152		21.072247
Jul	20.5066	0.374748		20.881348
Aug	21.9689	0.374748		22.343648
Sep	18.603781	0.449548		19.053329
Oct	17.7814	0.307428		18.088828
Nov	17.1597	0.315656		17.475356
Dec	18.2082	0.28424		18.49244
Total	235.398915	3.432582	0	238.831497

1998

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	17.8721	0.210188		18.082288
Feb	16.3497	0.185504		16.535204
Mar	19.1445	0.17578		19.32028
Apr	18.6367	0.170544		18.807244
May	21.3842	0.237116		21.621316
Jun	19.6522	0.26554		19.91774
Jul	22.2826	0.346324		22.628924
Aug	21.4026	0.37774		21.78034
Sep	18.5116	0.308176		18.819776
Oct	17.9715	0.333608		18.305108
Nov	16.6246	0.174284		16.798884
Dec	17.78288	0.163064		17.945944
Total	227.61518	2.947868	0	230.563048

**Public Water Supply Annual Statistical Report****Facility: Orange Water Department****Town: Orange, Massachusetts****PWS ID#: 1223000****1999**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	17.9444	0.180268		18.124668
Feb	16.6432	0.176528		16.819728
Mar	17.5736	0.167552		17.741152
Apr	19.2517	0.241604		19.493304
May	20.811	0.333608		21.144608
Jun	24.885992	0.328372		25.214364
Jul	23.1512	0.603636		23.754836
Aug	21.4057	0.290224		21.695924
Sep	19.4549	0.176528		19.631428
Oct	20.1043	0.214676		20.318976
Nov	20.1194	0.154088		20.273488
Dec	19.9619	0.412896		20.374796
Total	241.307292	3.27998	0	244.587272

**2000**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	19.3523	0.219164		19.571464
Feb	18.2279	0.157828		18.385728
Mar	19.5448	0.206448		19.751248
Apr	18.68755	0.187748		18.875298
May	20.7968	0.268532		21.065332
Jun	20.1714	0.230384		20.401784
Jul	20.8014	0.283492		21.084892
Aug	20.4769	0.25058		20.72748
Sep	19.8563	0.18326		20.03956
Oct	21.0864	0.17204		21.25844
Nov	19.8815	0.189992		20.071492
Dec	20.4948	0.184008		20.678808
Total	239.37805	2.533476	0	241.911526

**Average**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	19.4117	0.3041		19.7157
Feb	18.7420	0.2582		19.0001
Mar	20.6804	0.2852		20.9656
Apr	18.8264	0.3101		19.1366
May	20.4827	0.3433		20.8260
Jun	21.0557	0.4058		21.4615
Jul	21.3560	0.5131		21.8692
Aug	20.5327	0.4280		20.9607
Sep	18.8637	0.3669		19.2306
Oct	18.1872	0.2400		18.4272
Nov	18.0519	0.2357		18.2876
Dec	19.0545	0.2769		19.3314
Total	235.2448	3.9673	0.0000	239.2121

**Water Management Act (WMA) Annual Statistical Report****Facility: Erving Paper Mills****Town: Erving, Massachusetts****WMA #: 10709102****ALL Units are in MG*****Water Production and Consumptive Summary:*****1993**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	55.09			55.09
Feb	46.94			46.94
Mar	56.57			56.57
Apr	54.91			54.91
May	63.01			63.01
Jun	58.82			58.82
Jul	57.35			57.35
Aug	54.37			54.37
Sep	52.28			52.28
Oct	56.18			56.18
Nov	56.64			56.64
Dec	60.07			60.07
Total	672.23	0	0	672.23

**1994**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	54.247605			54.247605
Feb	59.360001			59.360001
Mar	61.664283			61.664283
Apr	61.663936			61.663936
May	63.890235			63.890235
Jun	66.806515			66.806515
Jul	64.59522			64.59522
Aug	59.752465			59.752465
Sep	63.869371			63.869371
Oct	58.922402			58.922402
Nov	58.946865			58.946865
Dec	55.462592			55.462592
Total	729.18149	0	0	729.18149

**1995**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	63.83			63.83
Feb	54.91			54.91
Mar	68.71			68.71
Apr	70.47			70.47
May	70.39			70.39
Jun	62.43			62.43
Jul	67.57			67.57
Aug	64.9			64.9
Sep	62.48			62.48
Oct	60.89			60.89
Nov	55.4			55.4
Dec	65.38			65.38
Total	767.36	0	0	767.36

**1996**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	59.01			59.01
Feb	58.6			58.6
Mar	65.34			65.34
Apr	60.77			60.77
May	60.22			60.22
Jun	64.49			64.49
Jul	61.95			61.95
Aug	70.69			70.69
Sep	62.68			62.68
Oct	72.18			72.18
Nov	68.2			68.2
Dec	61.93			61.93
Total	766.06	0	0	766.06

**1997**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	69.58			69.58
Feb	63.13			63.13
Mar	73.44			73.44
Apr	70.96			70.96
May	70.8			70.8
Jun	63.59			63.59
Jul	69.22			69.22
Aug	73.44			73.44
Sep	67.12			67.12
Oct	66.94			66.94
Nov	65.93			65.93
Dec	55.26			55.26
Total	809.41	0	0	809.41

**1998**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	65.96			65.96
Feb	59.64			59.64
Mar	61.96			61.96
Apr	62.23			62.23
May	69.32			69.32
Jun	66.55			66.55
Jul	64.79			64.79
Aug	68.25			68.25
Sep	64.56			64.56
Oct	71.65			71.65
Nov	62.51			62.51
Dec	64.42			64.42
Total	781.84	0	0	781.84



**Water Management Act (WMA) Annual Statistical Report****Facility: Erving Paper Mills****Town: Erving, Massachusetts****WMA #: 10709102****1999**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	68.537273			68.537273
Feb	62.065362			62.065362
Mar	69.115454			69.115454
Apr	67.981689			67.981689
May	71.635767			71.635767
Jun	68.681096			68.681096
Jul	75.22575			75.22575
Aug	67.94295			67.94295
Sep	64.849092			64.849092
Oct	70.859152			70.859152
Nov	67.353426			67.353426
Dec	65.971541			65.971541
Total	820.218552	0	0	820.218552

**2000**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	69.265366			69.265366
Feb	64.77107			64.77107
Mar	65.72435			65.72435
Apr	69.122448			69.122448
May	69.168773			69.168773
Jun	58.778175			58.778175
Jul	61.292543			61.292543
Aug	56.518984			56.518984
Sep	56.684437			56.684437
Oct	57.046006			57.046006
Nov	55.08370			55.08370
Dec	55.54241			55.54241
Total	738.99826	0.00000	0.00000	738.99826

**Average**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	63.1900			63.1900
Feb	58.6771			58.6771
Mar	65.3155			65.3155
Apr	64.7635			64.7635
May	67.3043			67.3043
Jun	63.7682			63.7682
Jul	65.2492			65.2492
Aug	64.4830			64.4830
Sep	61.8154			61.8154
Oct	64.3334			64.3334
Nov	61.2580			61.2580
Dec	60.5046			60.5046
Total	760.6623	0.0000	0.0000	760.6623

**Water Management Act (WMA) Annual Statistical Report****Facility: International Paper****Town: Erving, Massachusetts****WMA #: 10719201****ALL Units are in MG*****Water Production and Consumptive Summary:*****1993**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	12.049201			12.049201
Feb	10.5908			10.5908
Mar	10.8323			10.8323
Apr	10.8255			10.8255
May	12.597			12.597
Jun	10.3877			10.3877
Jul	10.7081			10.7081
Aug	13.1421			13.1421
Sep	11.874			11.874
Oct	11.8817			11.8817
Nov	11.4771			11.4771
Dec	11.59179			11.59179
Total	137.957291	0	0	137.957291

**1996**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	11.31			11.31
Feb	10.53			10.53
Mar	13.13			13.13
Apr	10.98			10.98
May	10.83			10.83
Jun	9.31			9.31
Jul	12.1			12.1
Aug	10.51			10.51
Sep	10.97			10.97
Oct	9.6			9.6
Nov	9.6			9.6
Dec	8.52			8.52
Total	127.39	0	0	127.39

**1994**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	13.55081			13.55081
Feb	12.8712			12.8712
Mar	12.3366			12.3366
Apr	10.7678			10.7678
May	9.7734			9.7734
Jun	10.2908			10.2908
Jul	10.1802			10.1802
Aug	7.1557			7.1557
Sep	10.6794			10.6794
Oct	10.8628			10.8628
Nov	10.0223			10.0223
Dec	9.572			9.572
Total	128.06301	0	0	128.06301

**1997**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	8.98			8.98
Feb	8.67			8.67
Mar	10.44			10.44
Apr	9.61			9.61
May	8.97			8.97
Jun	9.29			9.29
Jul	10.46			10.46
Aug	8.84			8.84
Sep	11.07			11.07
Oct	10.29			10.29
Nov	8.92			8.92
Dec	9.56			9.56
Total	115.1	0	0	115.1

**1995**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	9.6254			9.6254
Feb	9.2122			9.2122
Mar	10.55176			10.55176
Apr	9.3938			9.3938
May	9.1412			9.1412
Jun	9.0276			9.0276
Jul	10.4379			10.4379
Aug	9.743159			9.743159
Sep	7.577522			7.577522
Oct	10.2542			10.2542
Nov	10.3808			10.3808
Dec	10.1969			10.1969
Total	115.542441	0	0	115.542441

**1998**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	9.94			9.94
Feb	9.51			9.51
Mar	10.66			10.66
Apr	10.08			10.08
May	10.59			10.59
Jun	9.43			9.43
Jul	10.69			10.69
Aug	11.16			11.16
Sep	10.93			10.93
Oct	10.46			10.46
Nov	8.86			8.86
Dec	8.05			8.05
Total	120.36	0	0	120.36

**Water Mangement Act (WMA) Annual Statistical Report****Facility: International Paper****Town: Erving, Massachusetts****WMA #: 10719201****1999**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	8.6			8.6
Feb	8.64			8.64
Mar	10.1			10.1
Apr	11.84			11.84
May	14.6			14.6
Jun	12.84			12.84
Jul	9.85			9.85
Aug	11.06			11.06
Sep	10.29			10.29
Oct	10.94			10.94
Nov	9.92			9.92
Dec	10.47			10.47
Total	129.15	0	0	129.15

**2000**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	9.5			9.5
Feb	8.74			8.74
Mar	9.87			9.87
Apr	8.08			8.08
May	7.53			7.53
Jun	7.52			7.52
Jul	7.98			7.98
Aug	9.69			9.69
Sep	1.27			1.27
Oct	0.51			0.51
Nov	0.00			0.00
Dec	0.00			0.00
Total	70.69	0.00	0.00	70.69

**Average**

	Amount of Water Pumped from Own Sources (1)	Amount of Water Purchased From Other System (2)	Amount of Water Sold to Other Systems (3)	Net Water Consumption 1+2-3
Jan	10.4444			10.4444
Feb	9.8455			9.8455
Mar	10.9901			10.9901
Apr	10.1971			10.1971
May	10.5040			10.5040
Jun	9.7620			9.7620
Jul	10.3008			10.3008
Aug	10.1626			10.1626
Sep	9.3326			9.3326
Oct	9.3498			9.3498
Nov	8.6475			8.6475
Dec	8.4951			8.4951
Total	118.0316	0.0000	0.0000	118.0316

## **APPENDIX D: IHA Results for USGS Gages:**

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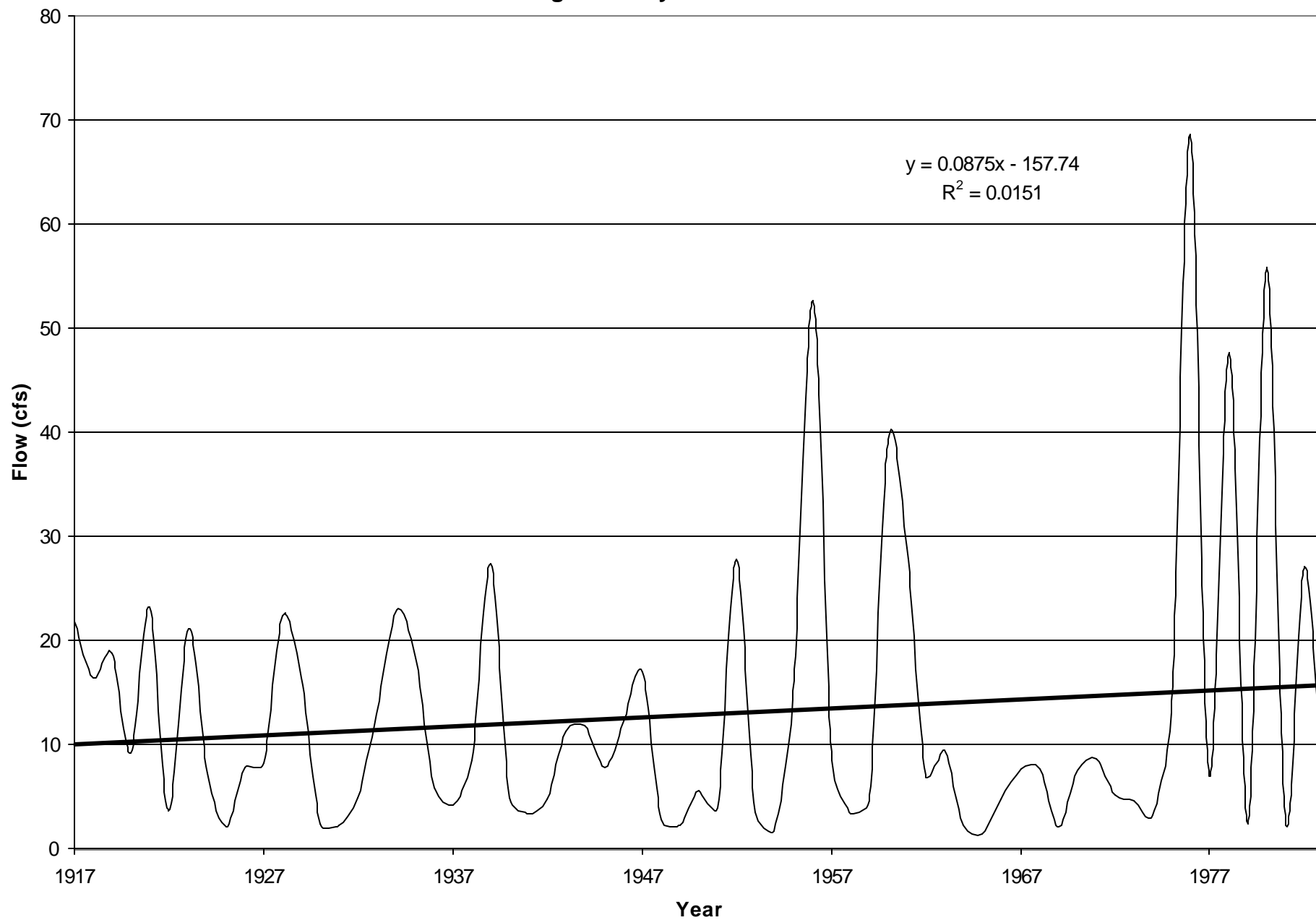
- **Tarbell Brook,**
- **Miller River near Winchendon,**
- **Priest Brook,**
- **Moss Brook,**
- **Otter River,**
- **Lake Rohunta Outlet,**
- **Millers River at South Royalston**

**Tarbell Brook near Winchendon, MA**  
**Drainage Area= 17.8 square miles**  
**Period of Record: Water Years 1917-1983**  
***IHA Results***

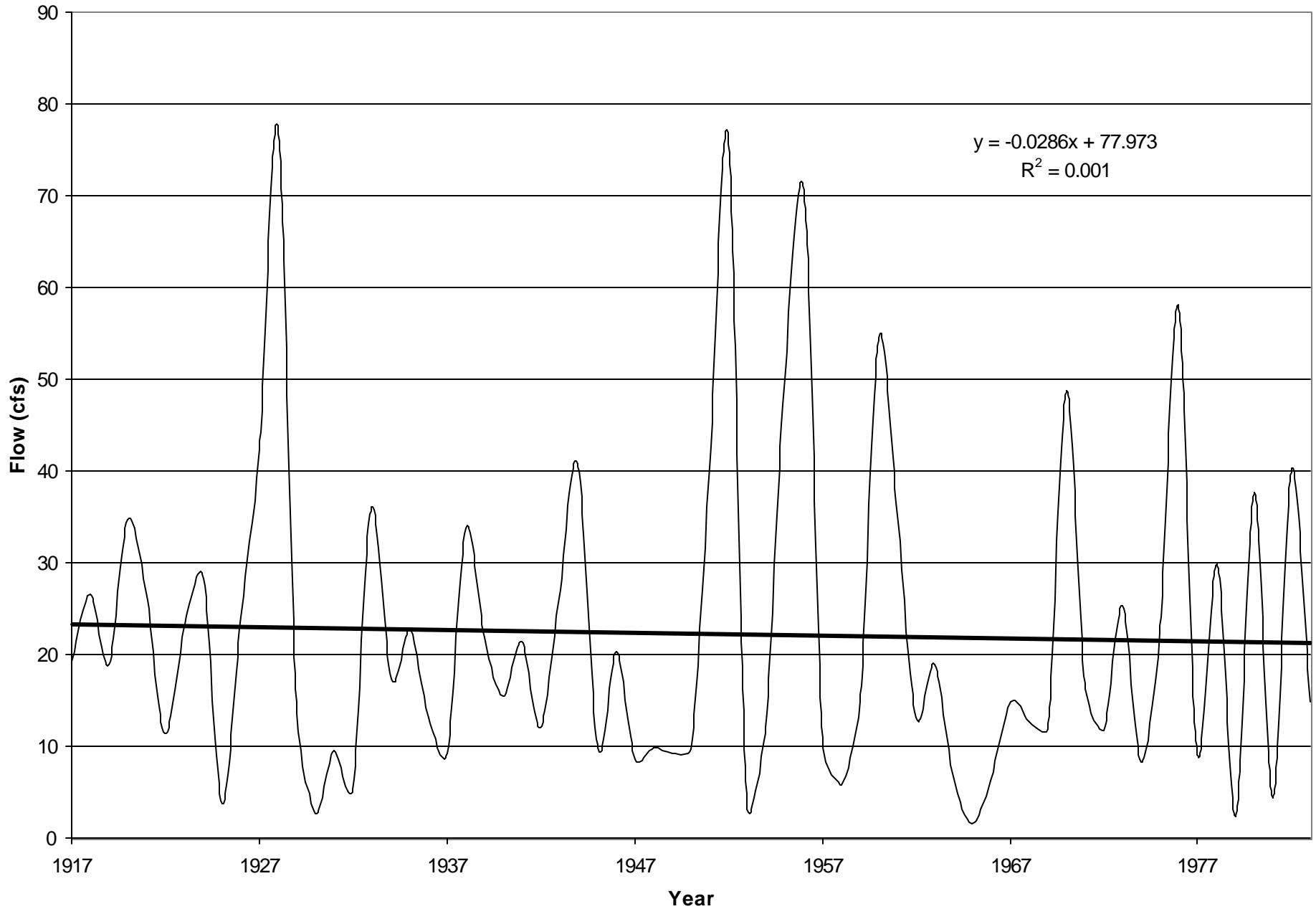
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1. Average Monthly Flow for October
2. Average Monthly Flow for November
3. Average Monthly Flow for December
4. Average Monthly Flow for January
5. Average Monthly Flow for February
6. Average Monthly Flow for March
7. Average Monthly Flow for April
8. Average Monthly Flow for May
9. Average Monthly Flow for June
10. Average Monthly Flow for July
11. Average Monthly Flow for August
12. Average Monthly Flow for September
13. 1-Day Minimum Flow
14. 3-Day Minimum Flow
15. 7-Day Minimum Flow
16. 30-Day Minimum Flow
17. 90-Day Minimum Flow
18. 1-Day Maximum Flow
19. 3-Day Maximum Flow
20. 7-Day Maximum Flow
21. 30-Day Maximum Flow
22. 90-Day Maximum Flow
23. Zero Days
24. Base Flow
25. Julian Date of Annual 1-Day Minimum Flow
26. Julian Date of Annual 1-Day Maximum Flow
27. Low Pulse Count
28. Low Pulse Duration
29. High Pulse Count
30. High Pulse Duration
31. Rise Rate
32. Fall Rate
33. Reversals

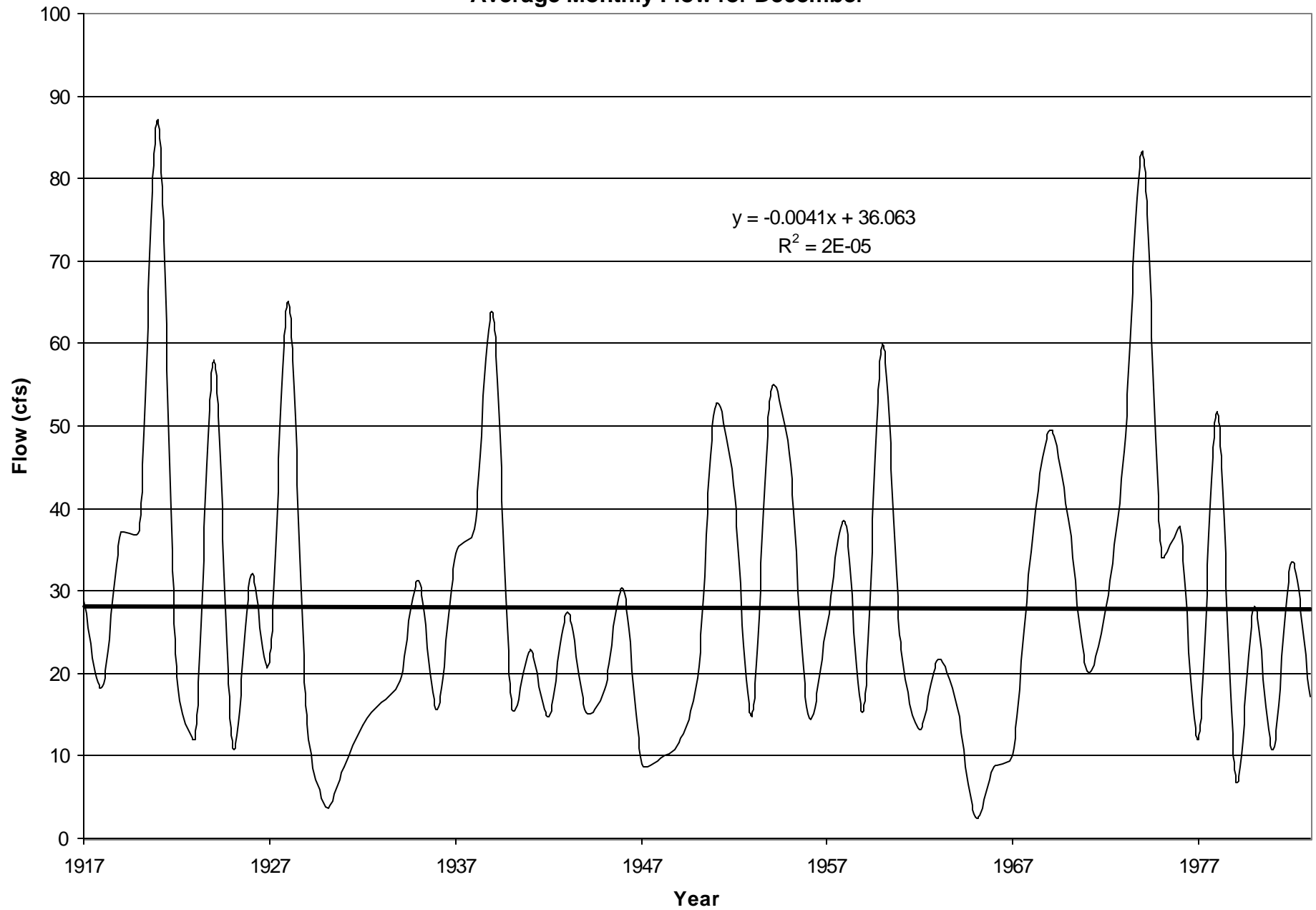
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for October**



**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for November**

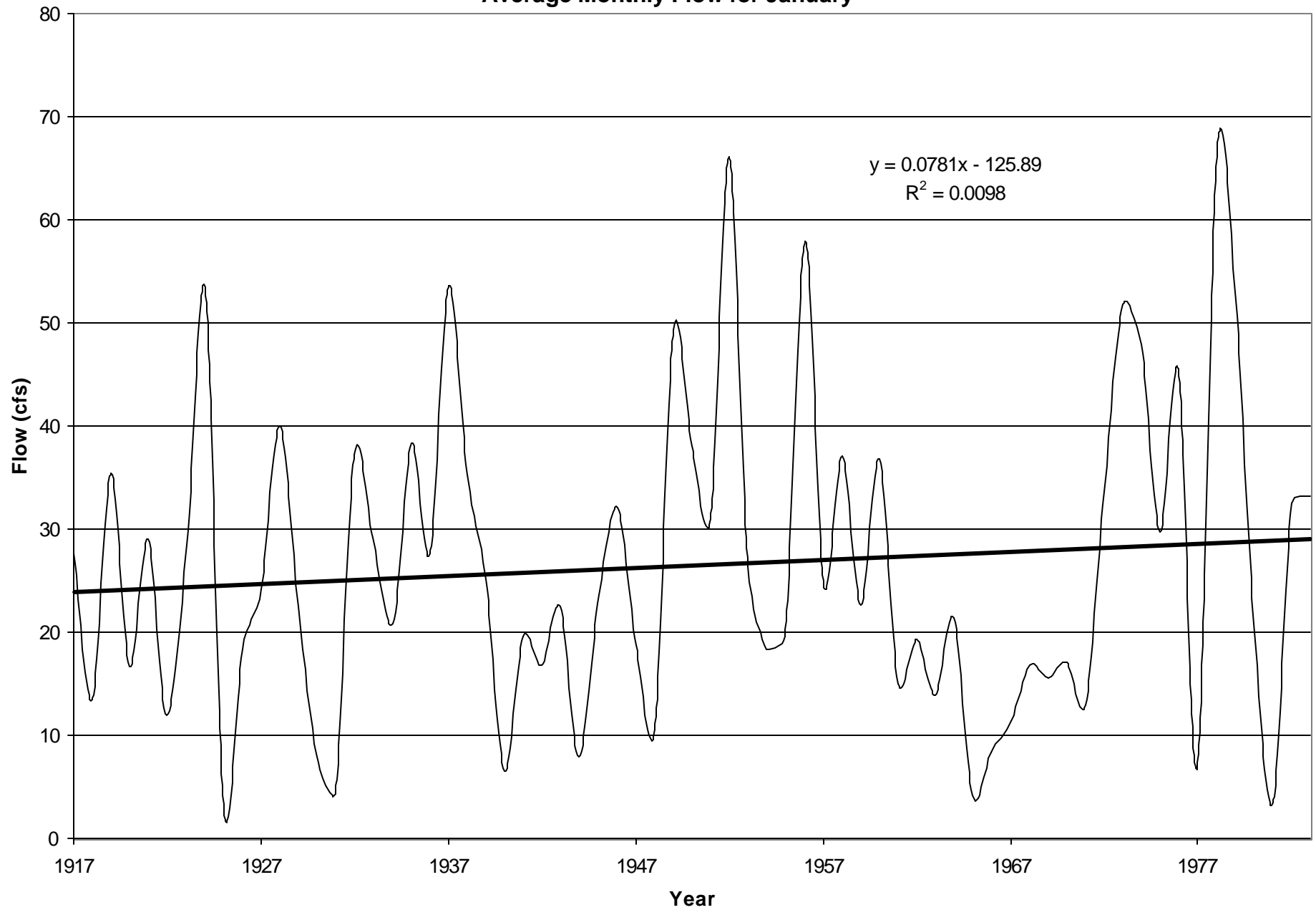


**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for December**

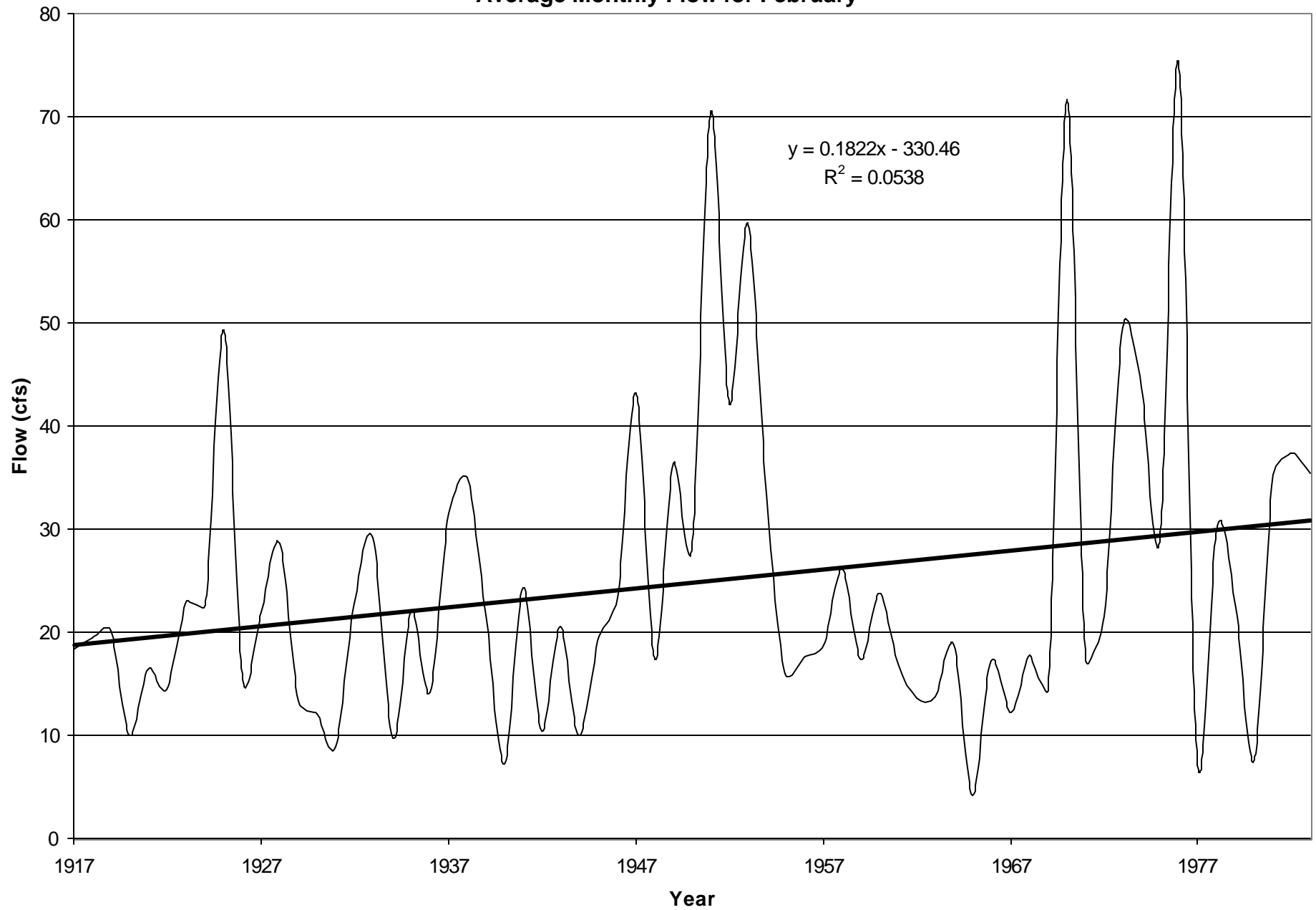




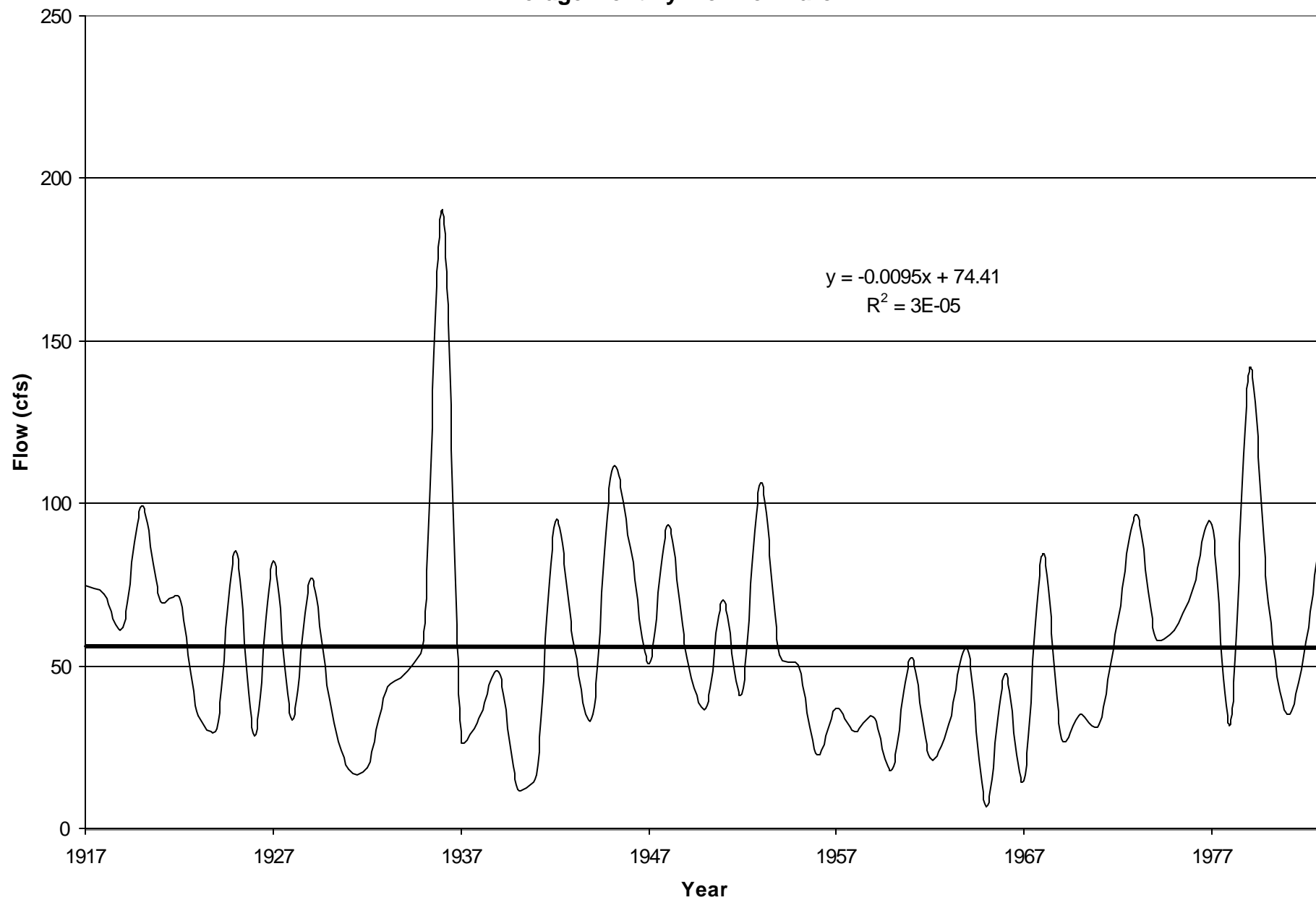
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for January**



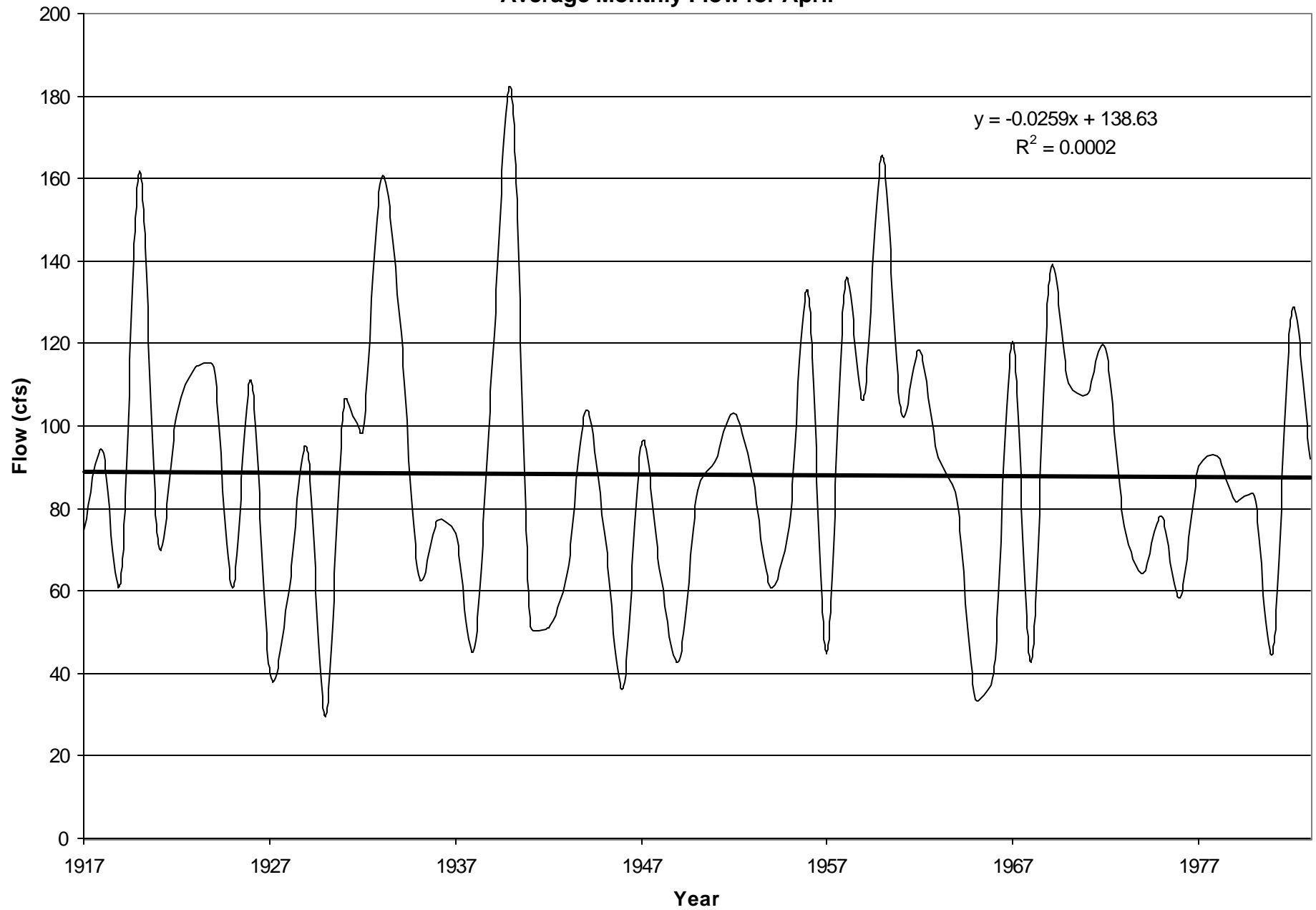
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for February**



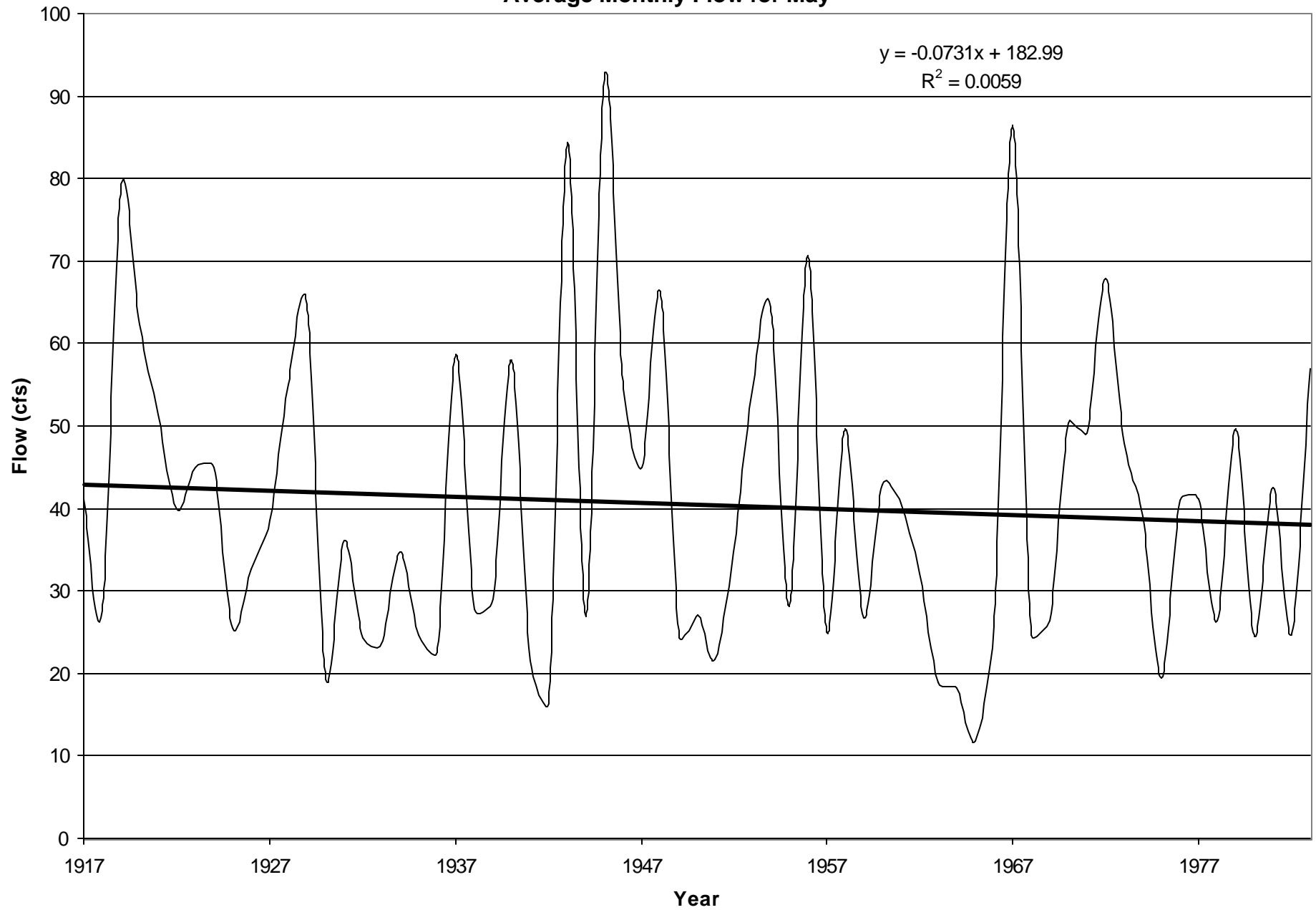
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for March**



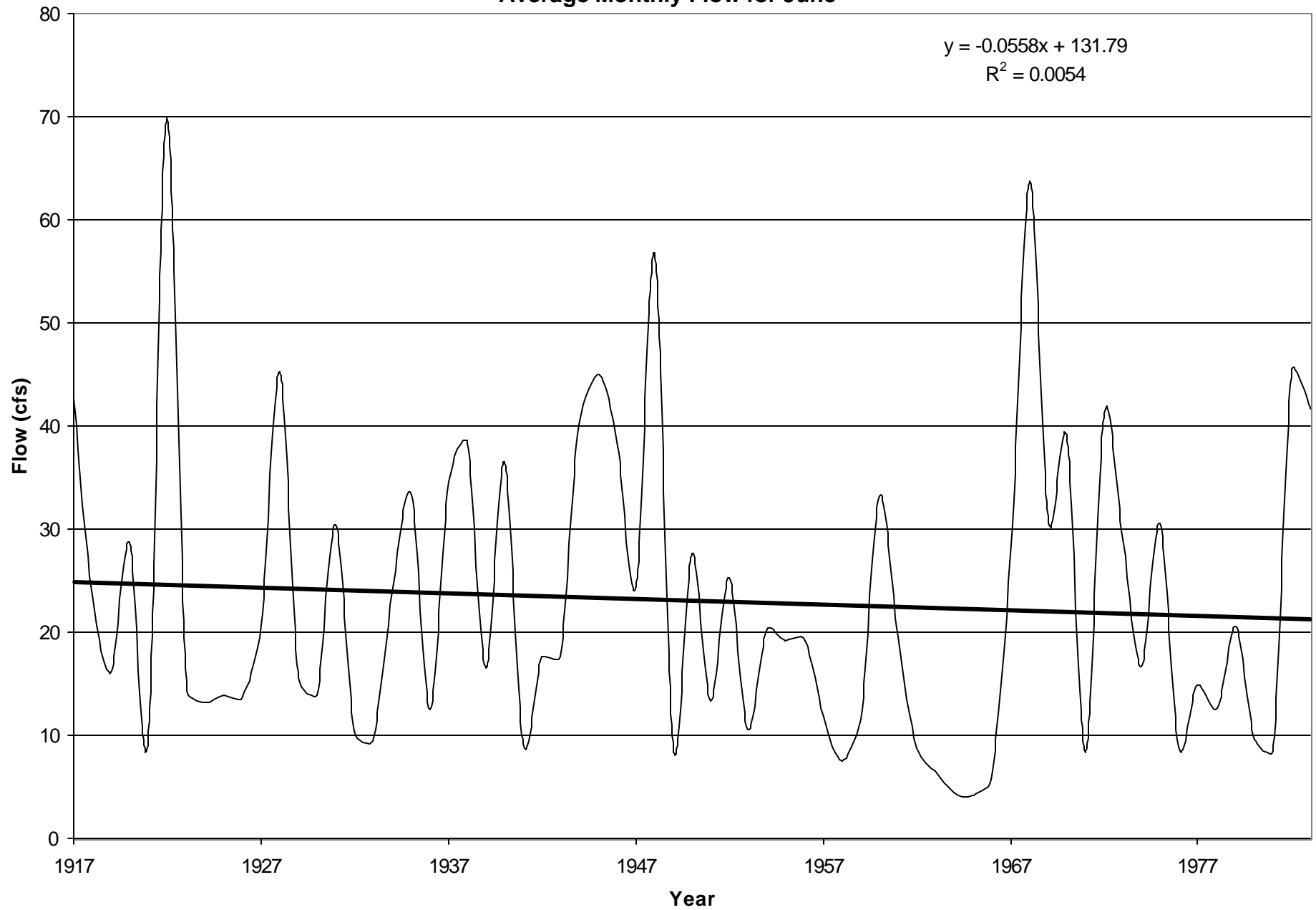
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for April**



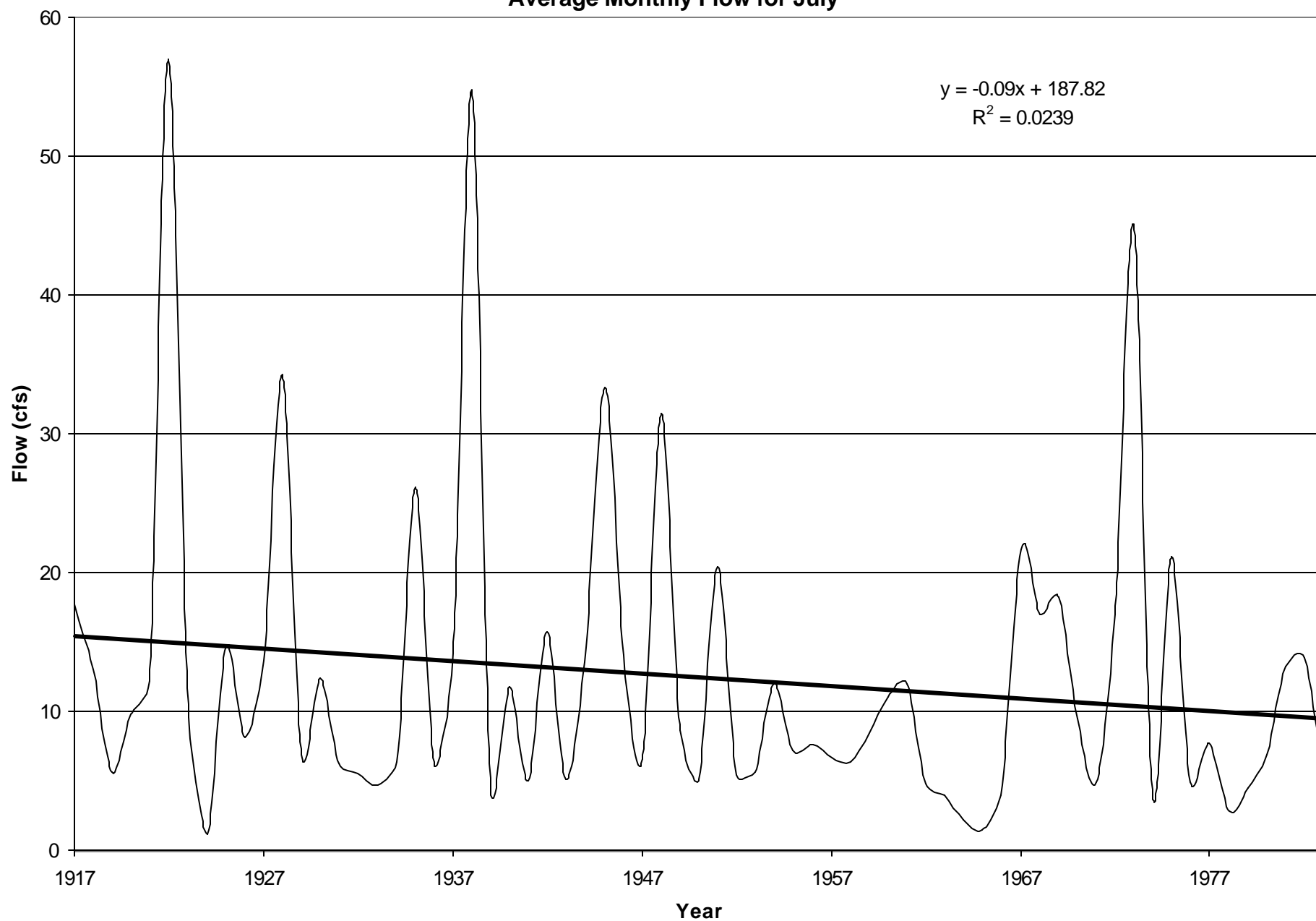
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for May**



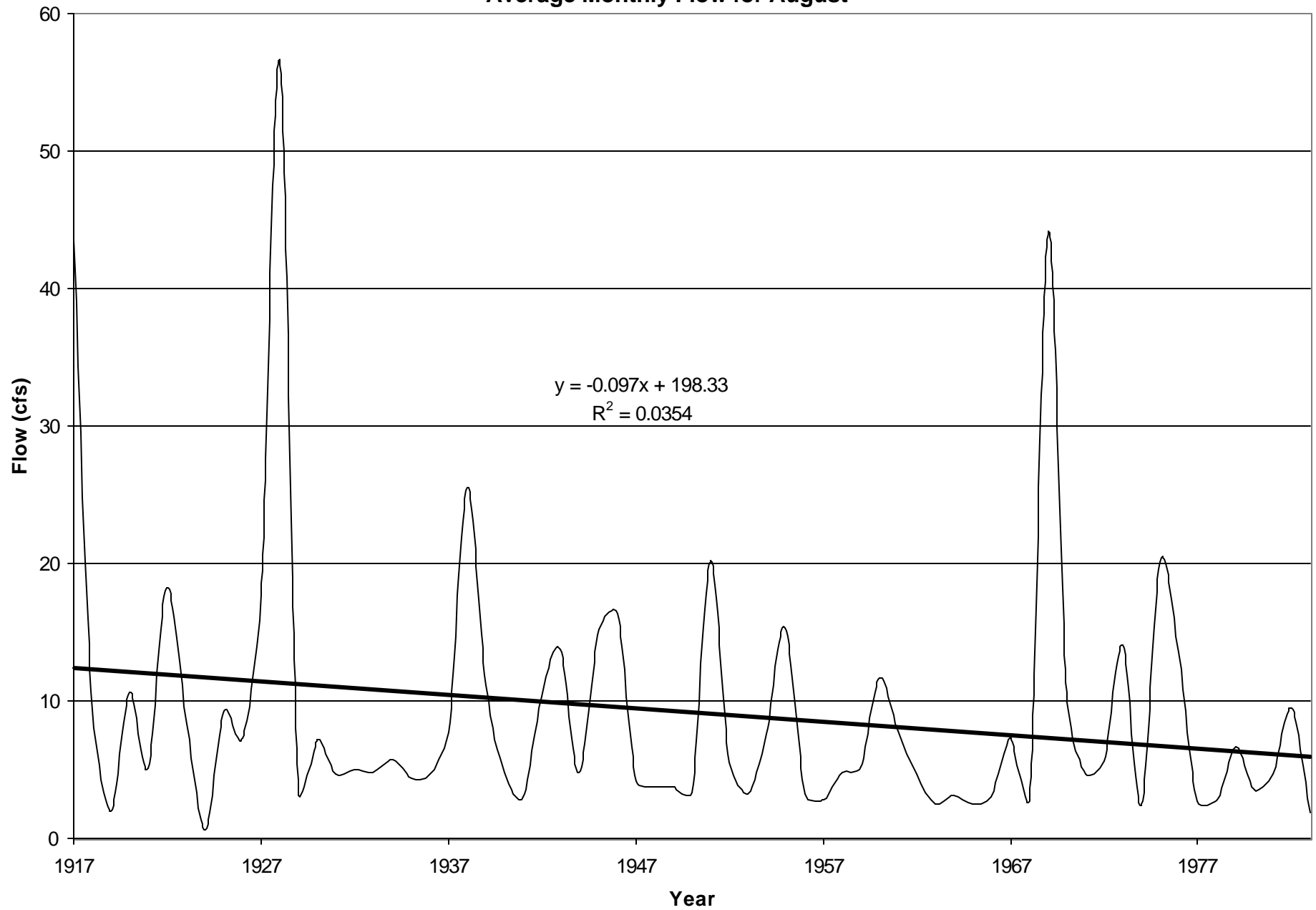
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for June**



**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for July**

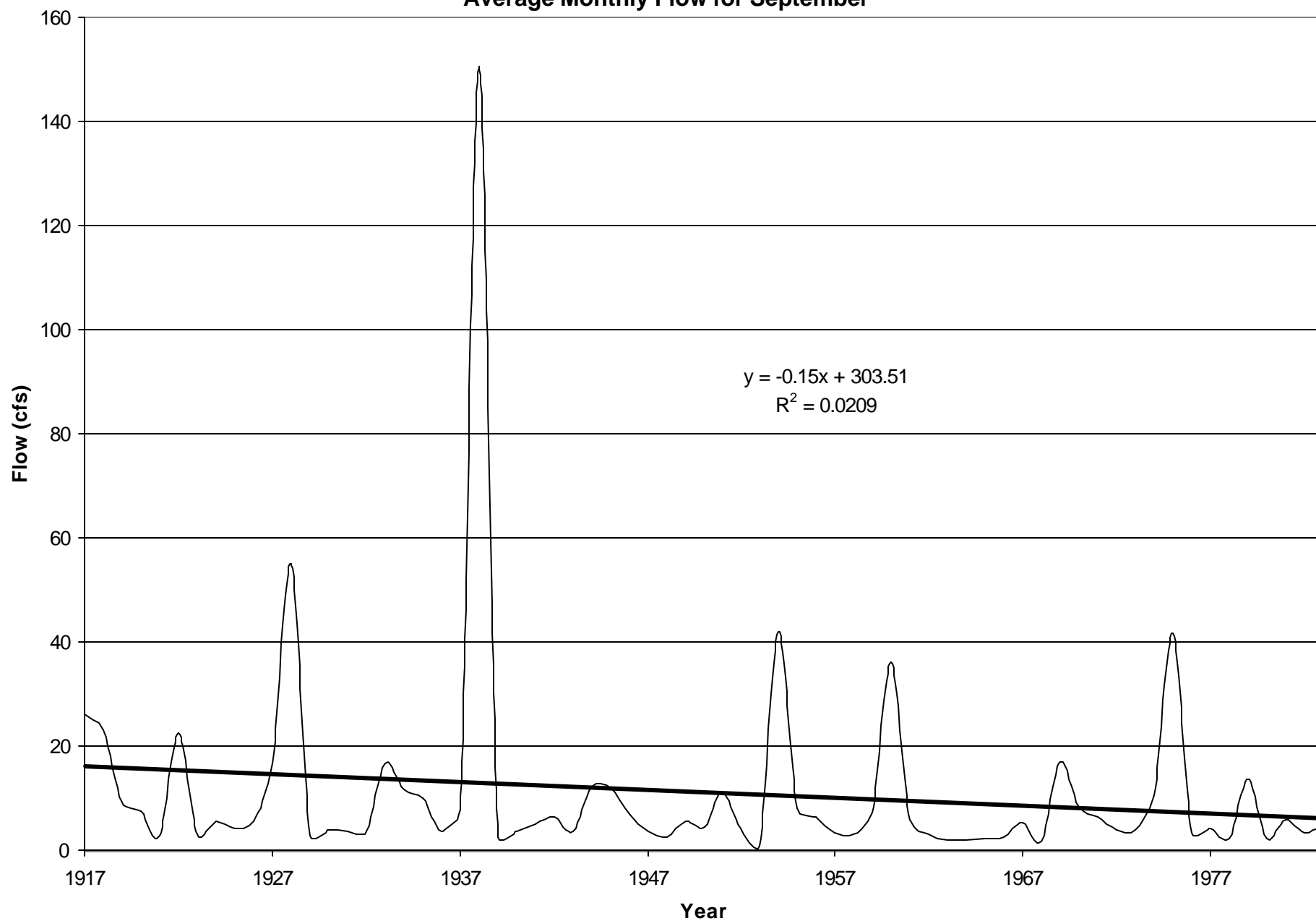


**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for August**

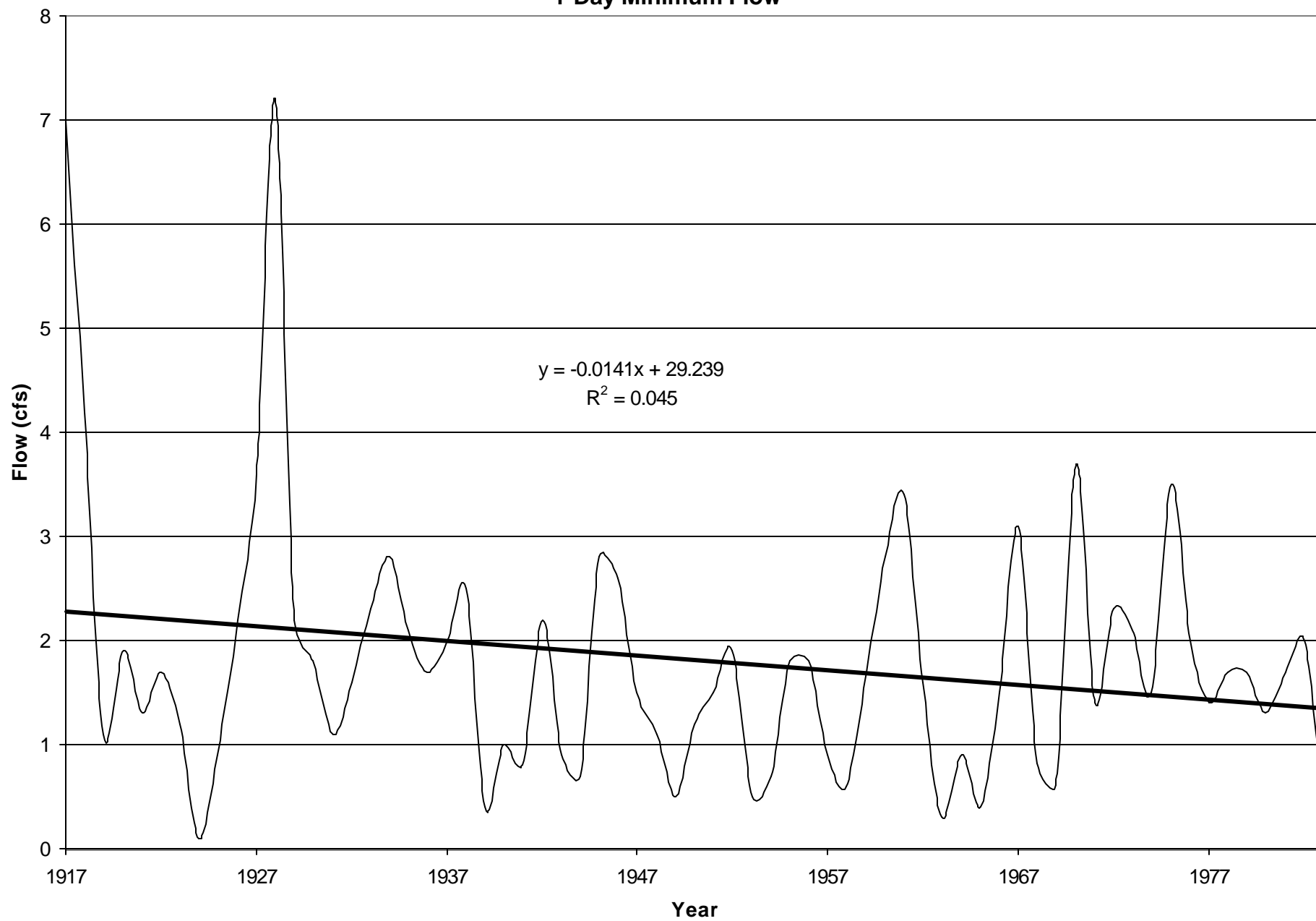




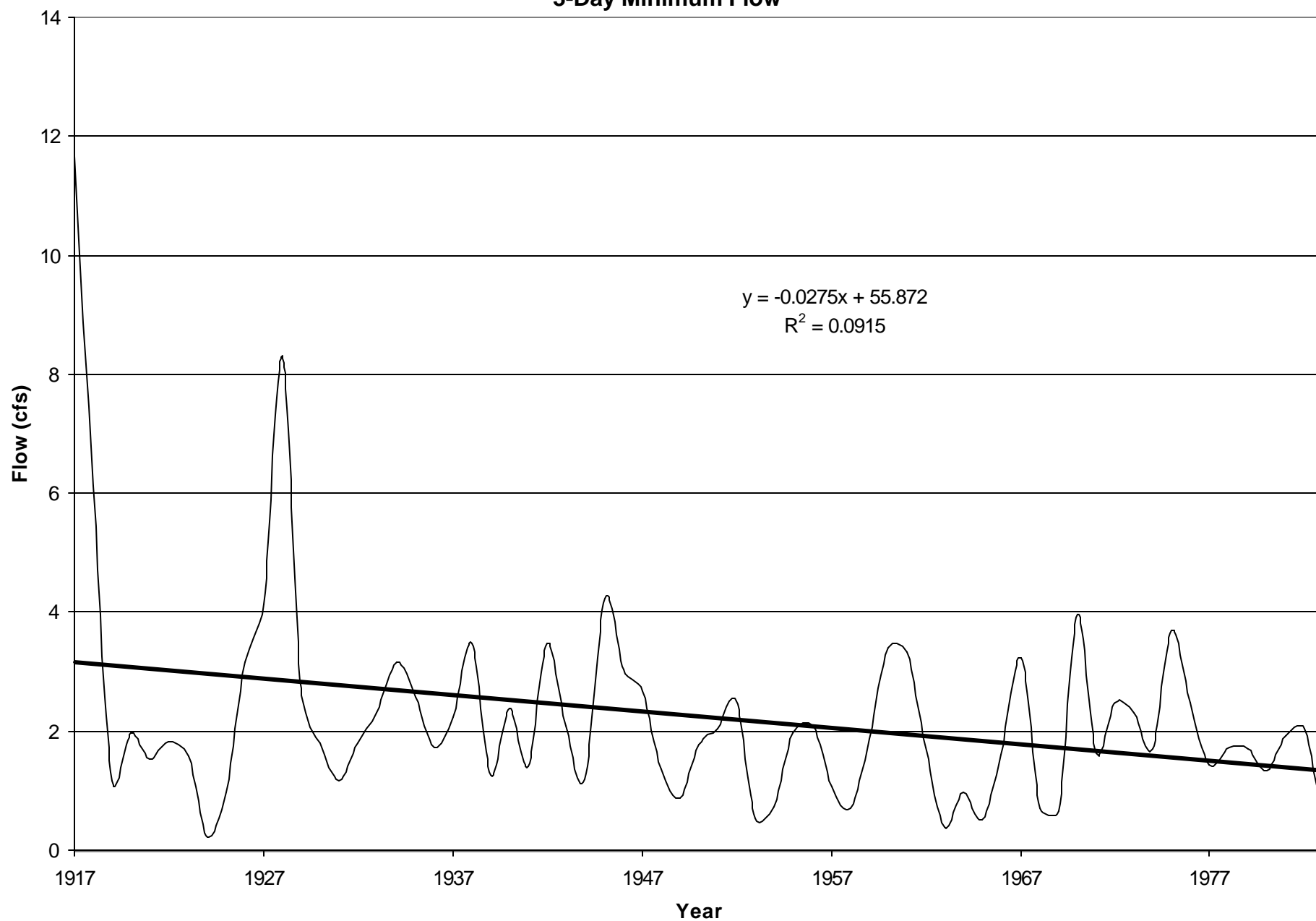
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Average Monthly Flow for September**



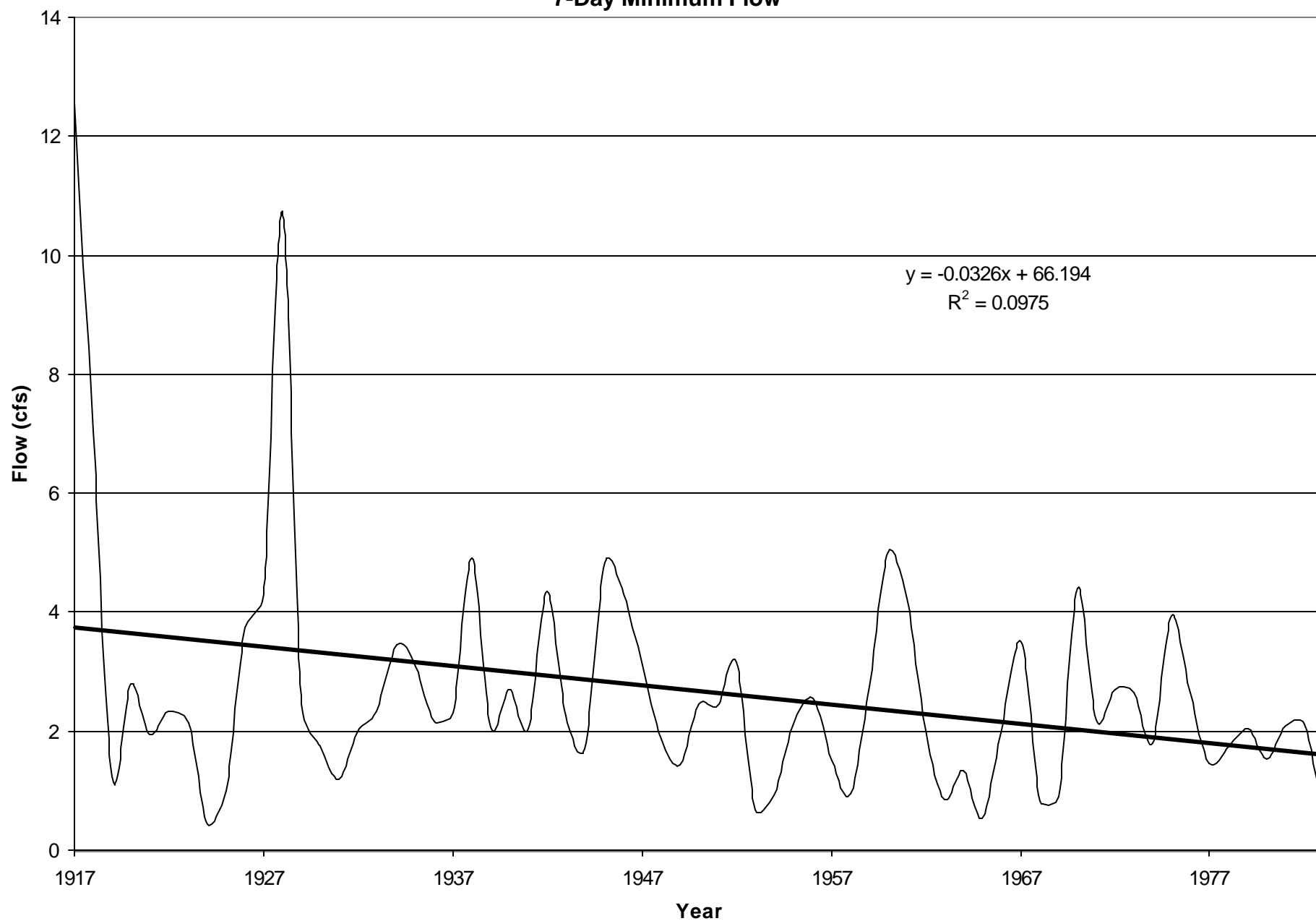
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**1-Day Minimum Flow**



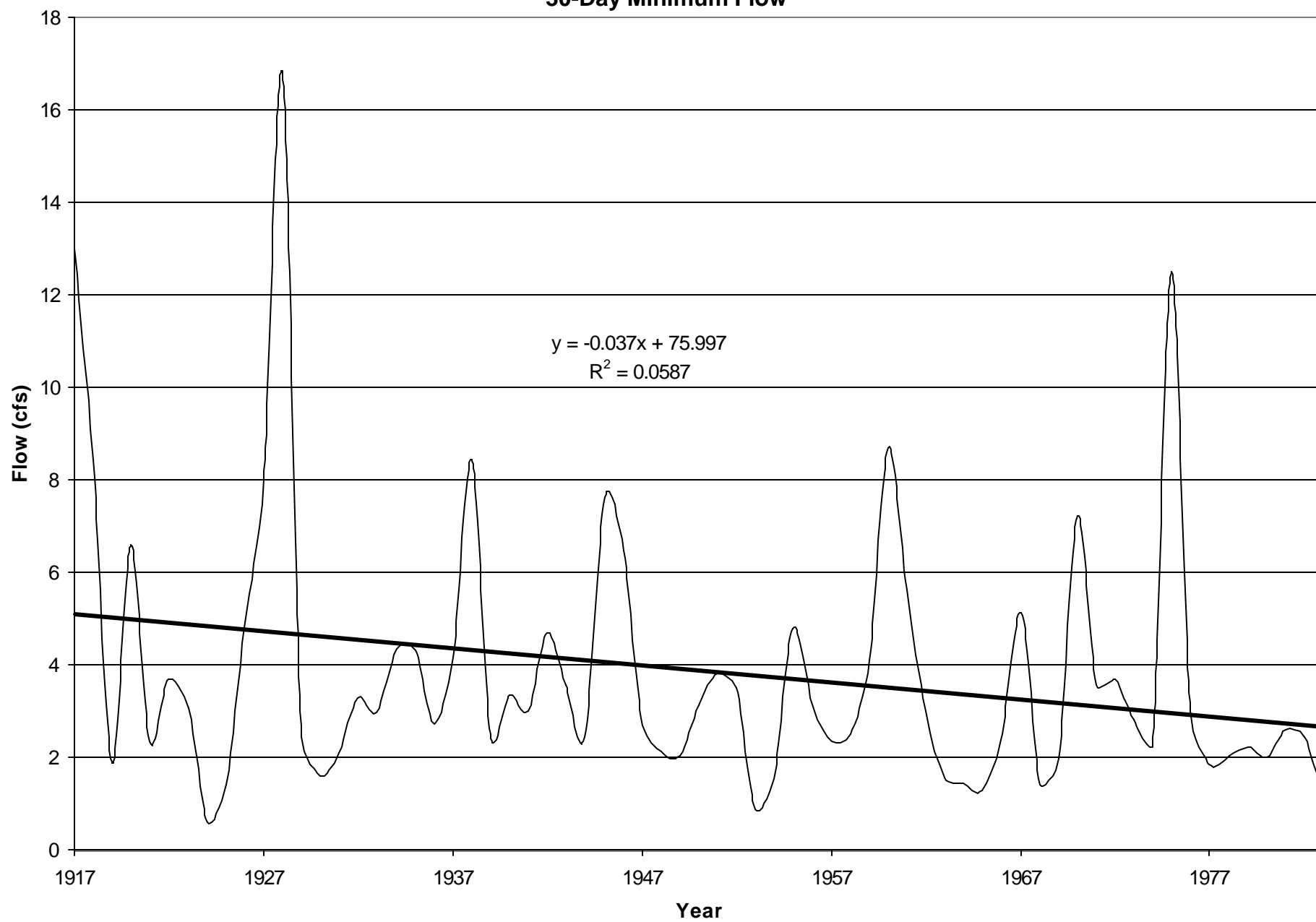
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**3-Day Minimum Flow**



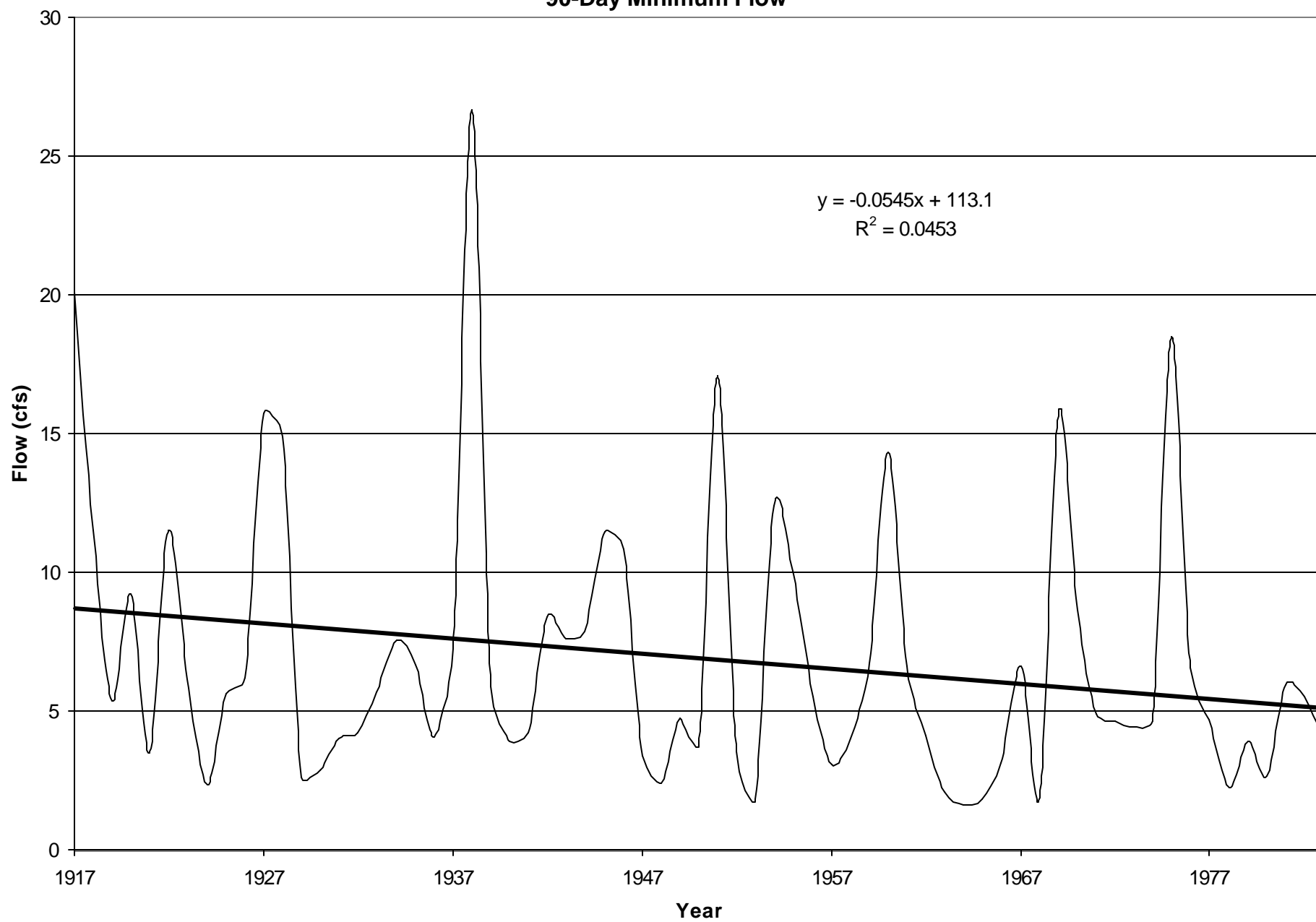
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**7-Day Minimum Flow**



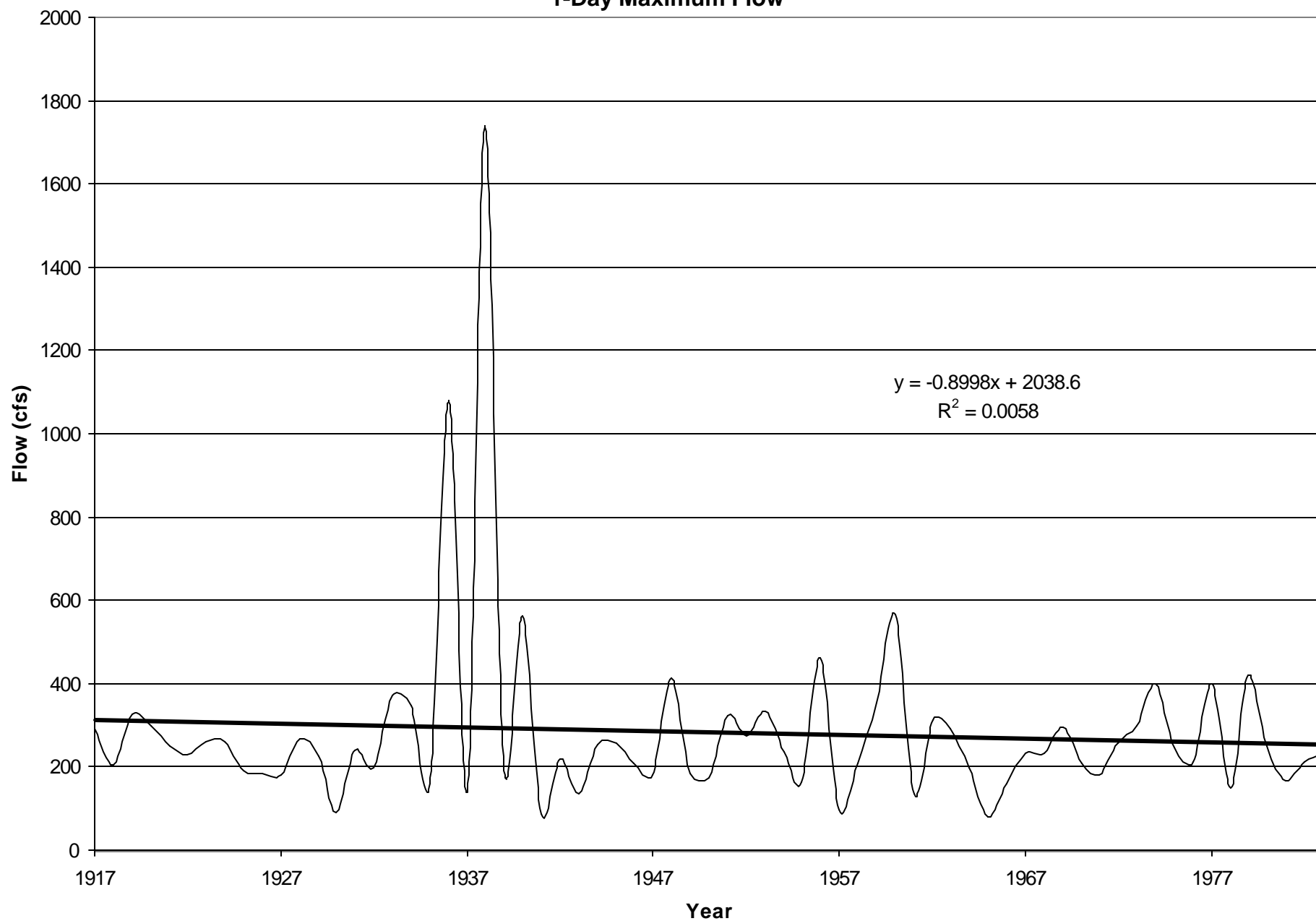
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**30-Day Minimum Flow**



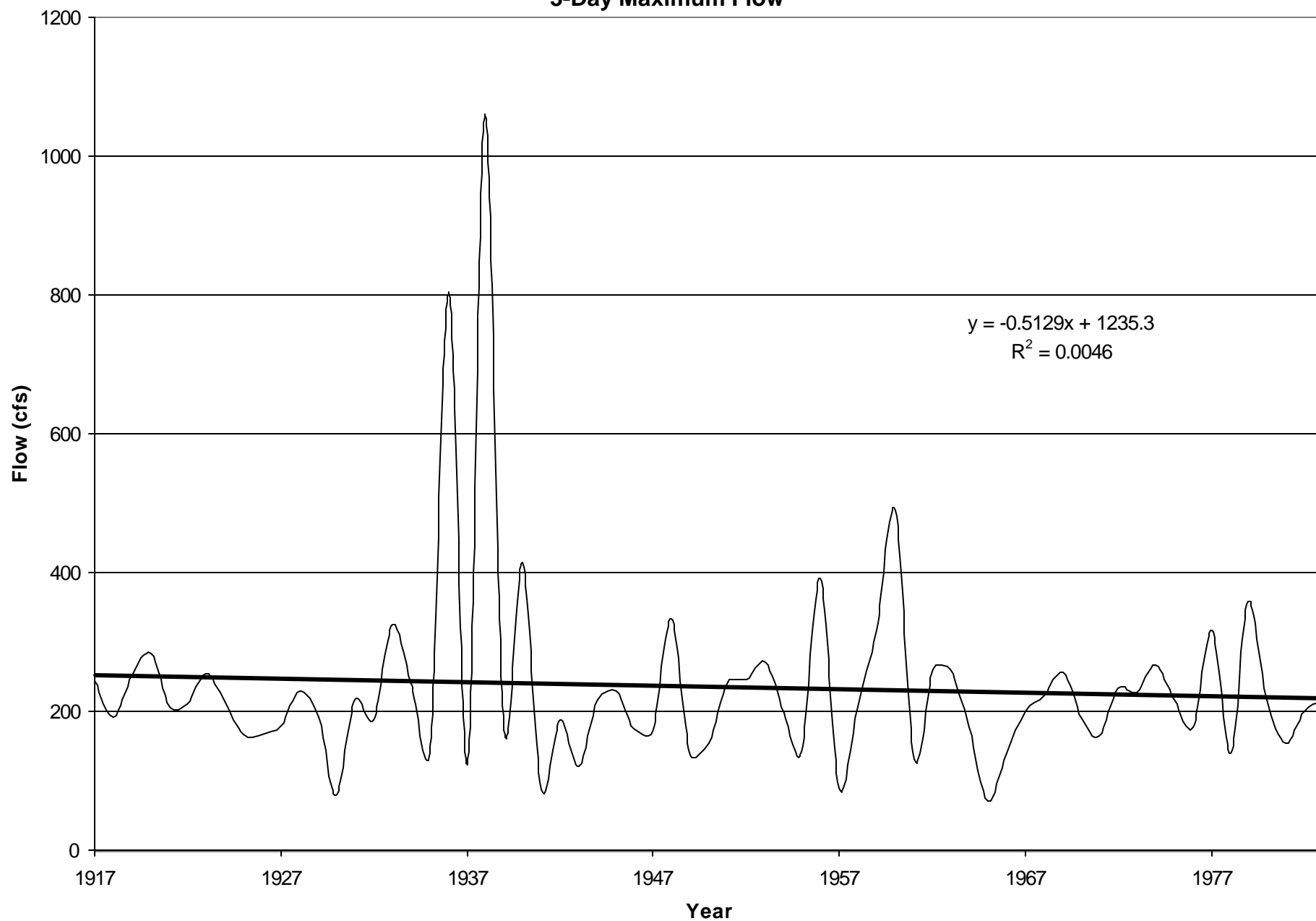
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**90-Day Minimum Flow**



**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**1-Day Maximum Flow**

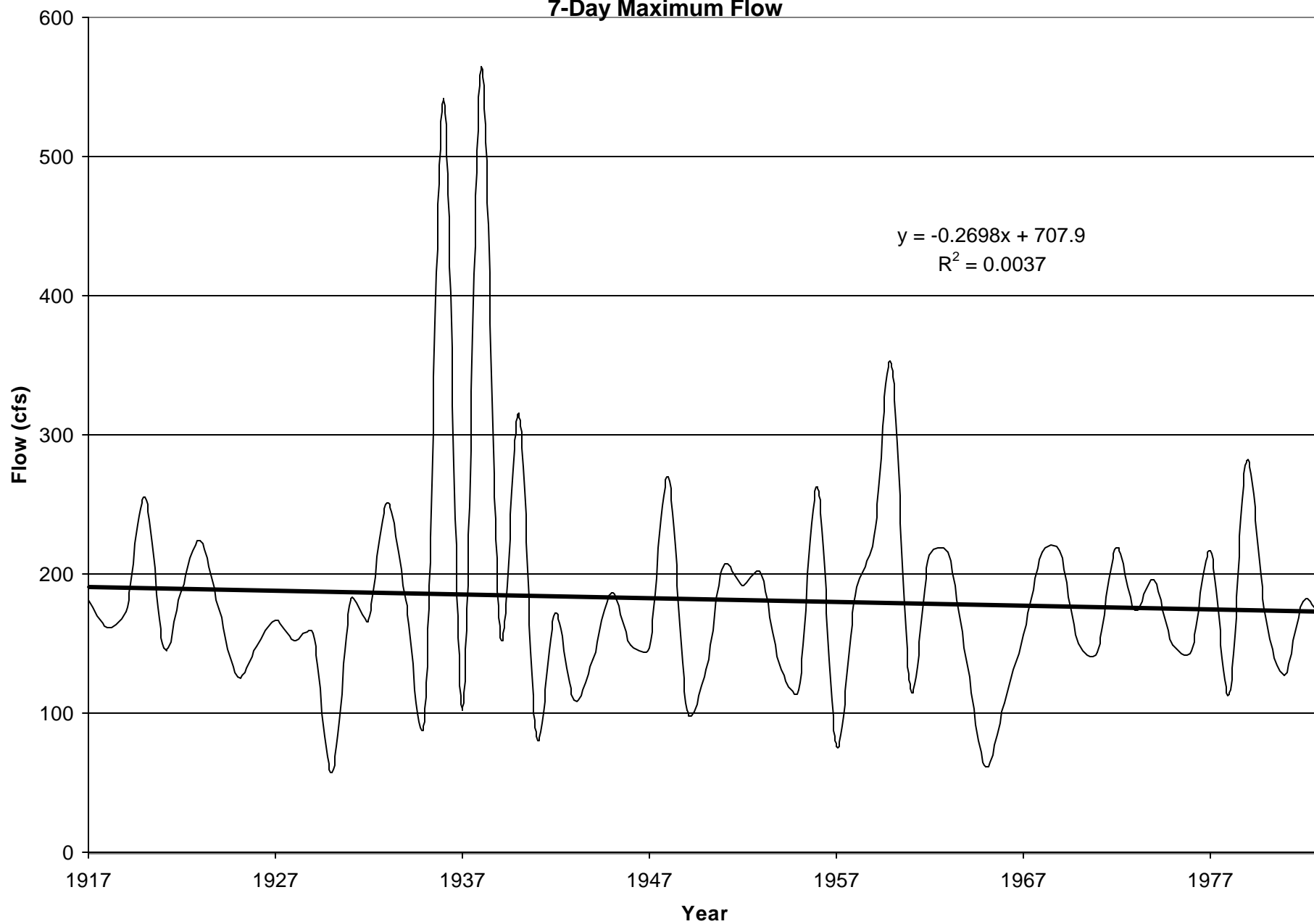


**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**3-Day Maximum Flow**

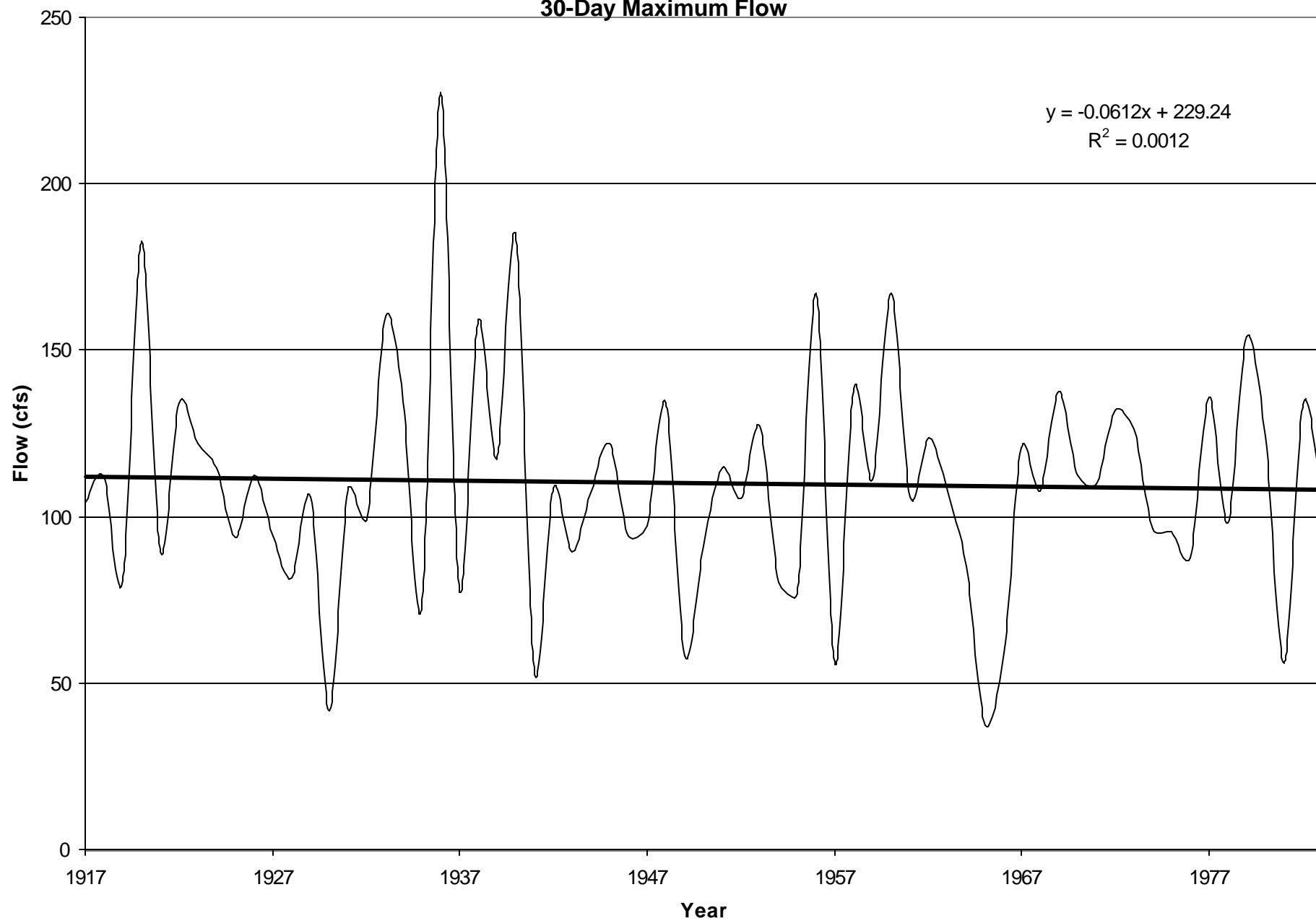




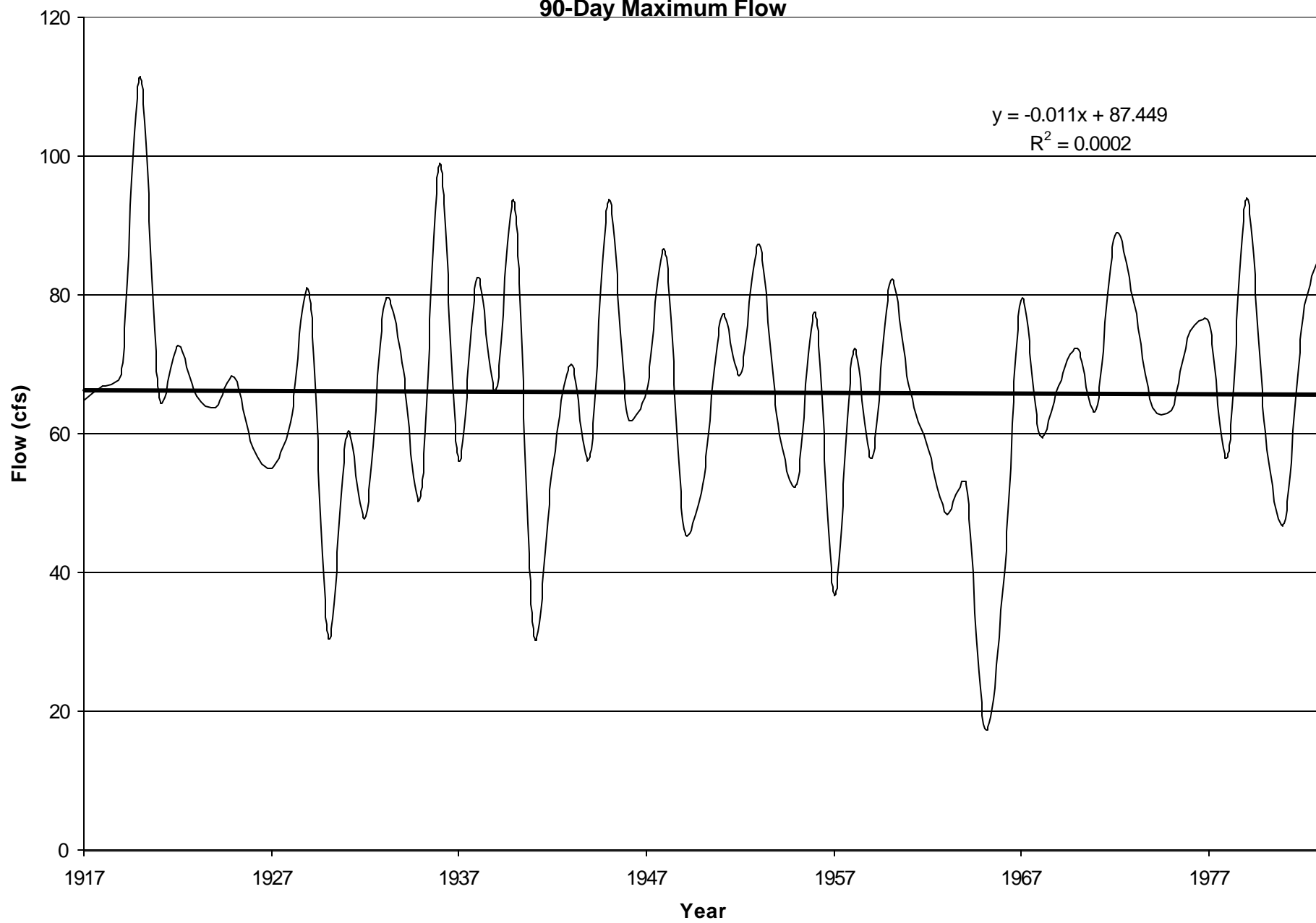
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**7-Day Maximum Flow**



**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**30-Day Maximum Flow**

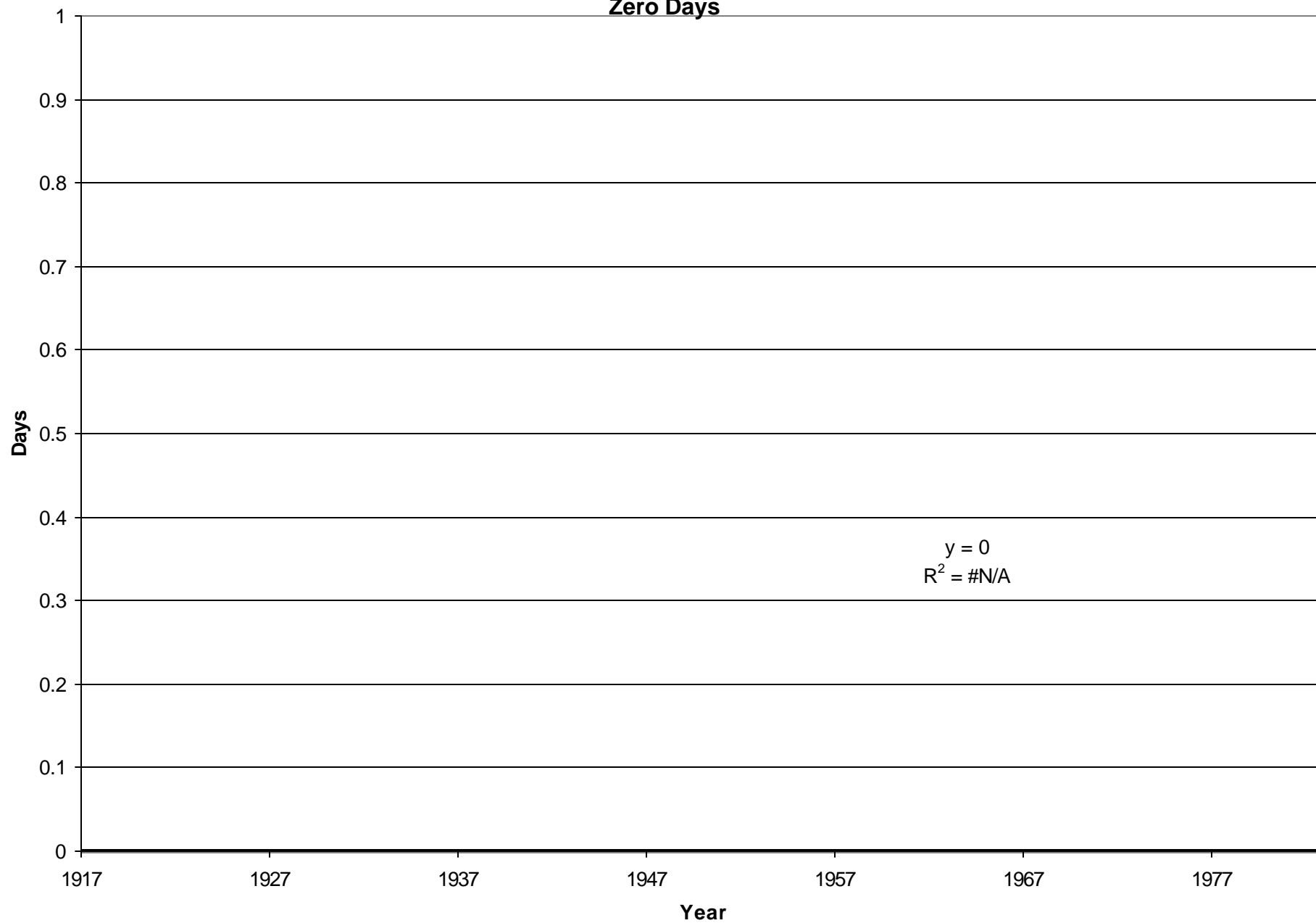


**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**90-Day Maximum Flow**



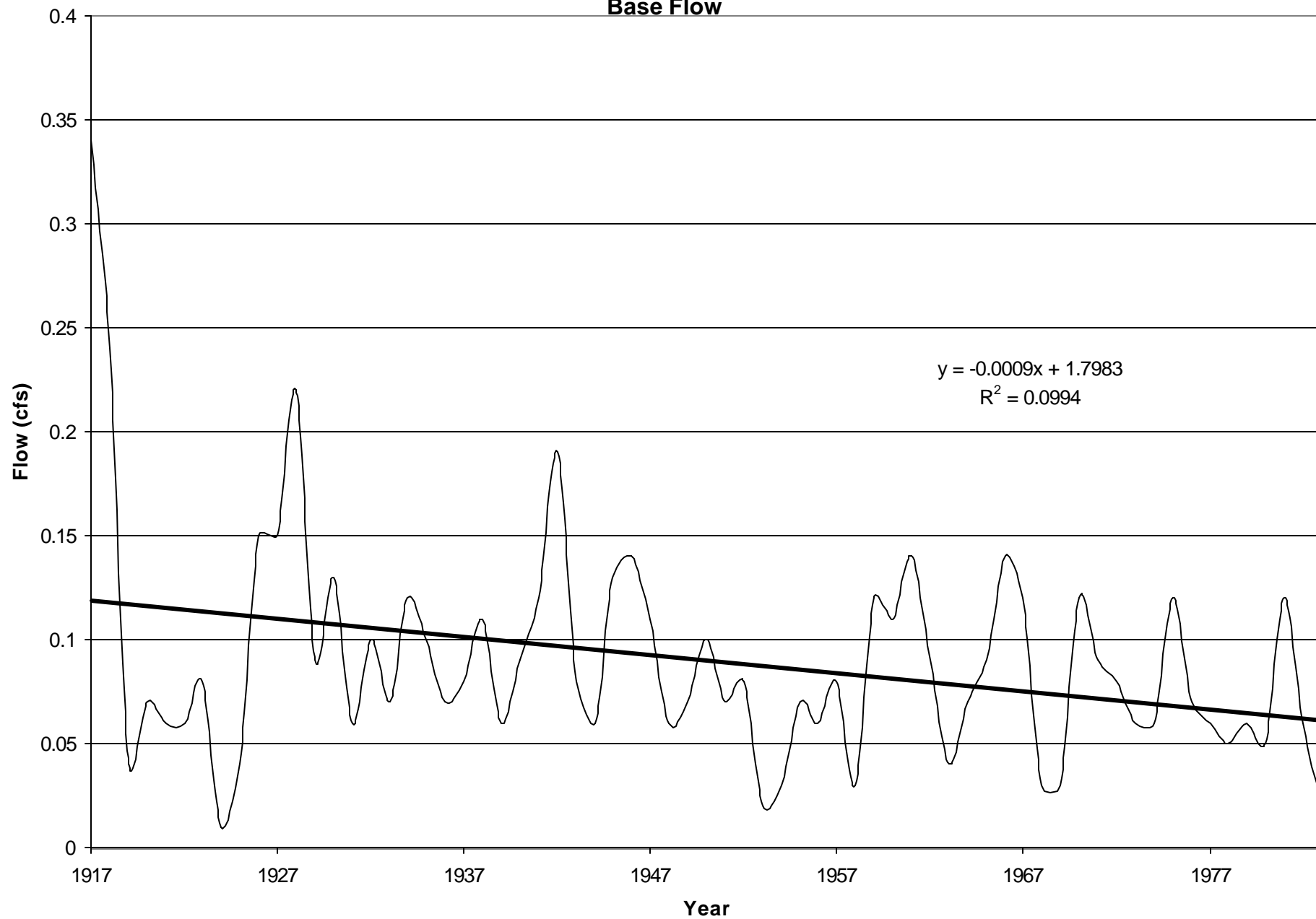
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**

**Zero Days**

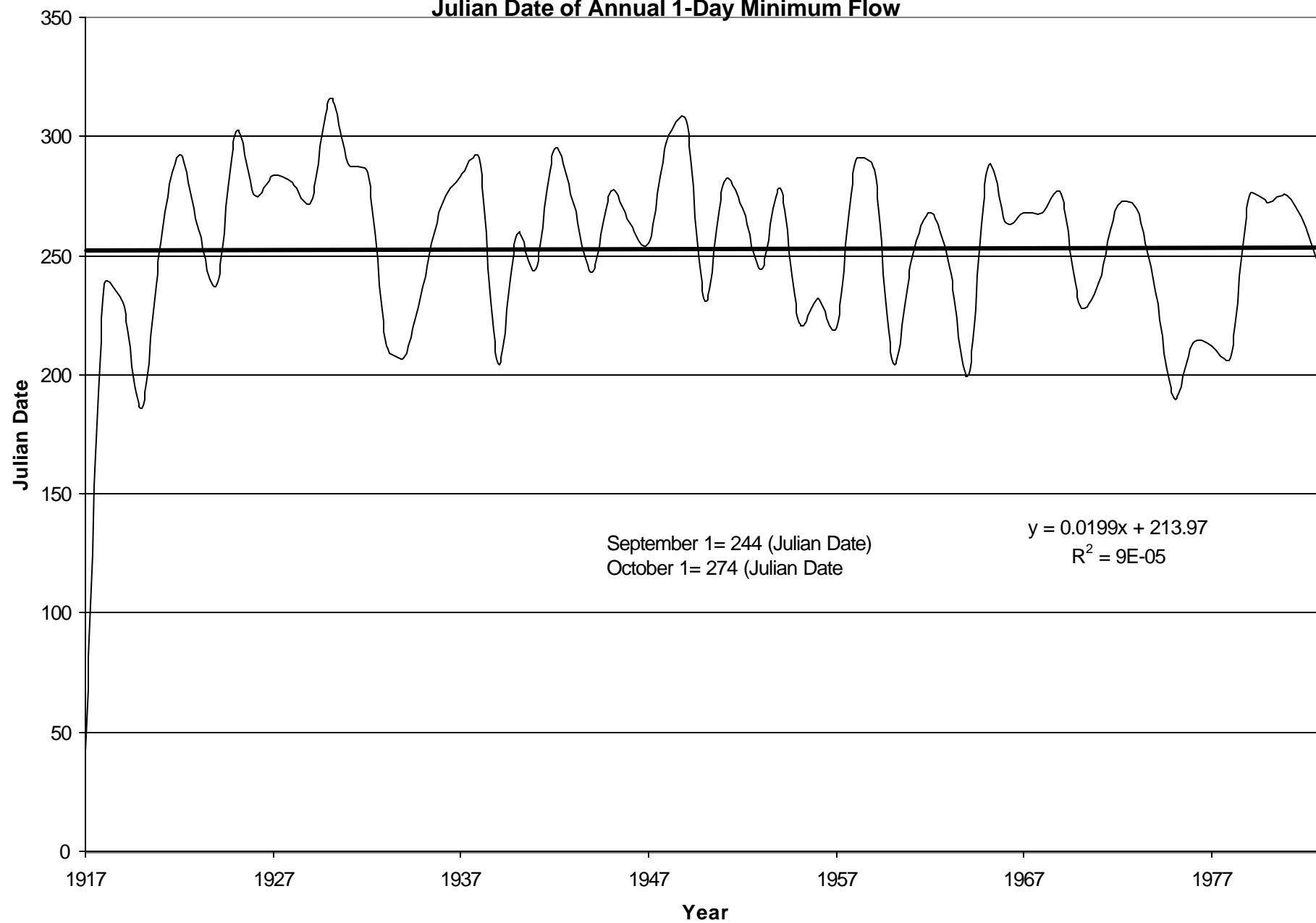


# Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi

## Base Flow

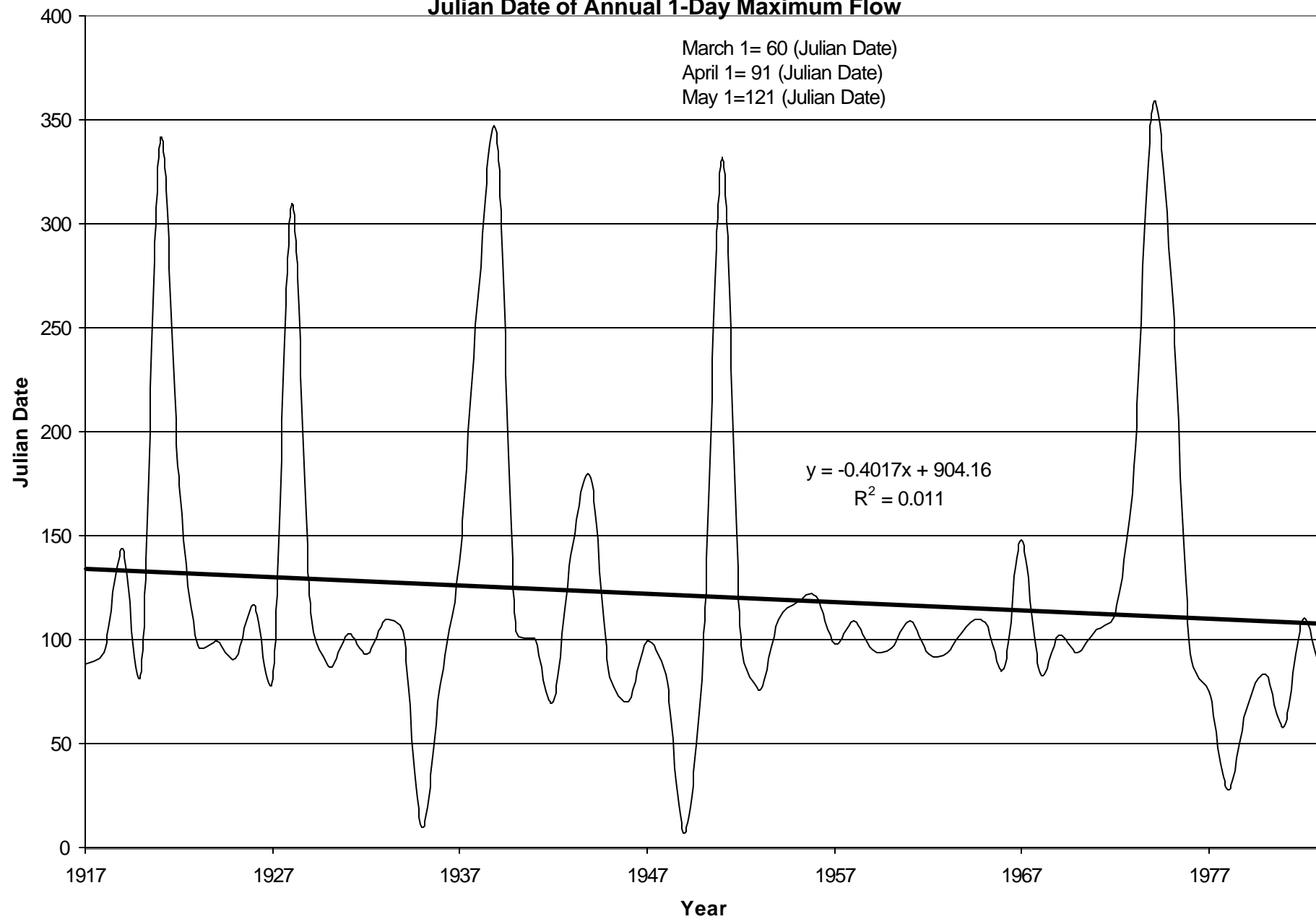


**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Julian Date of Annual 1-Day Minimum Flow**



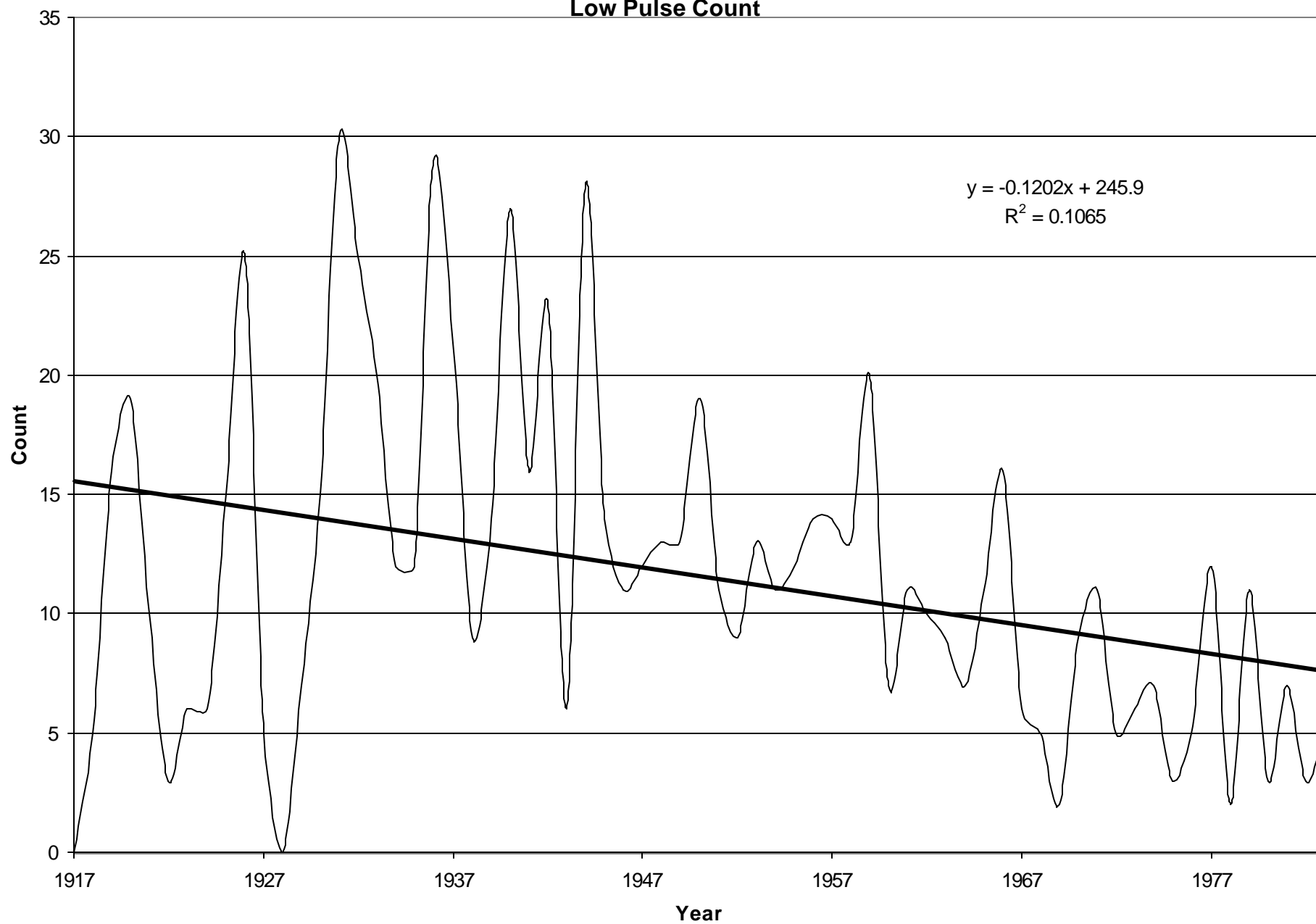
# Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi

## Julian Date of Annual 1-Day Maximum Flow



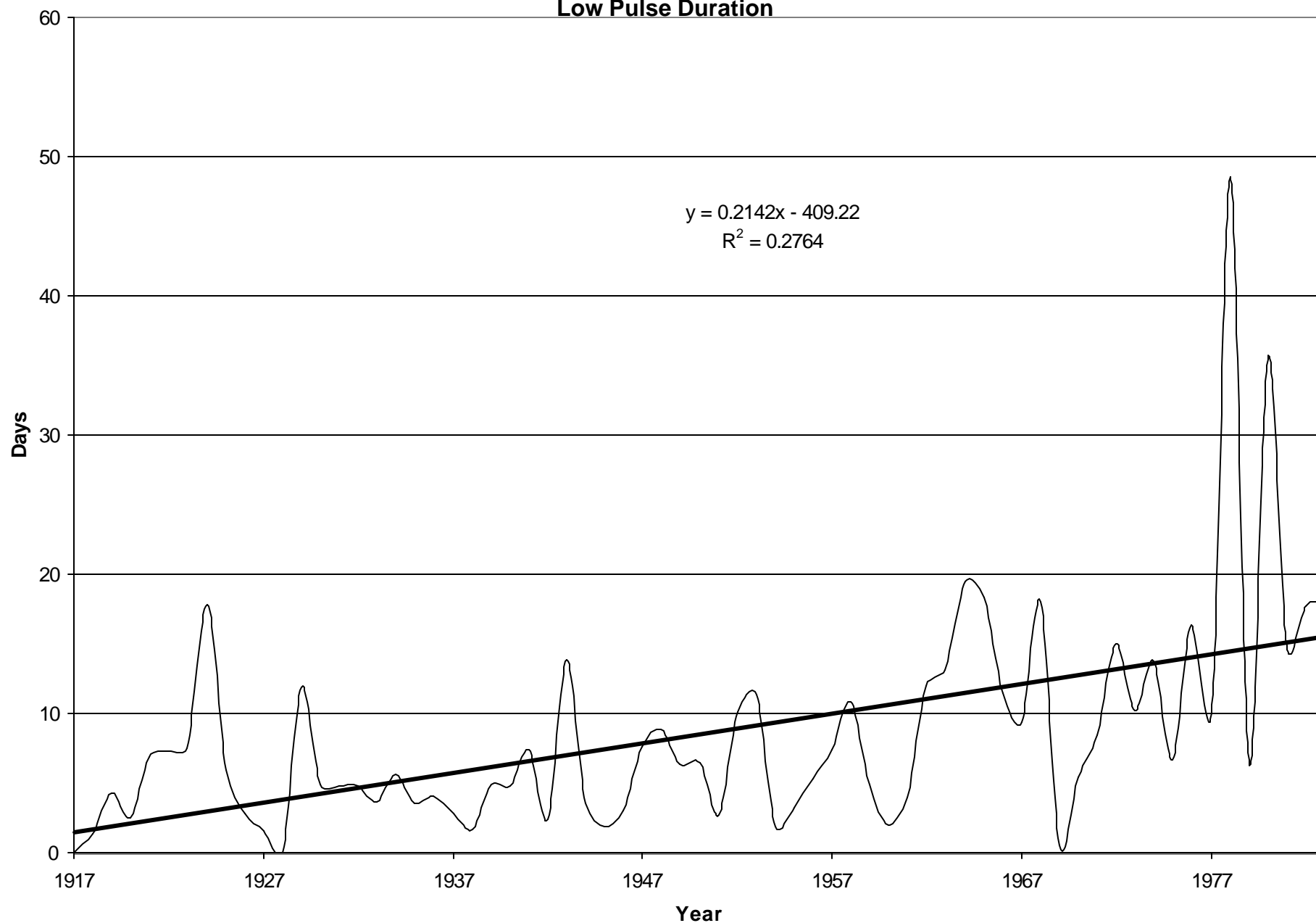
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**

**Low Pulse Count**

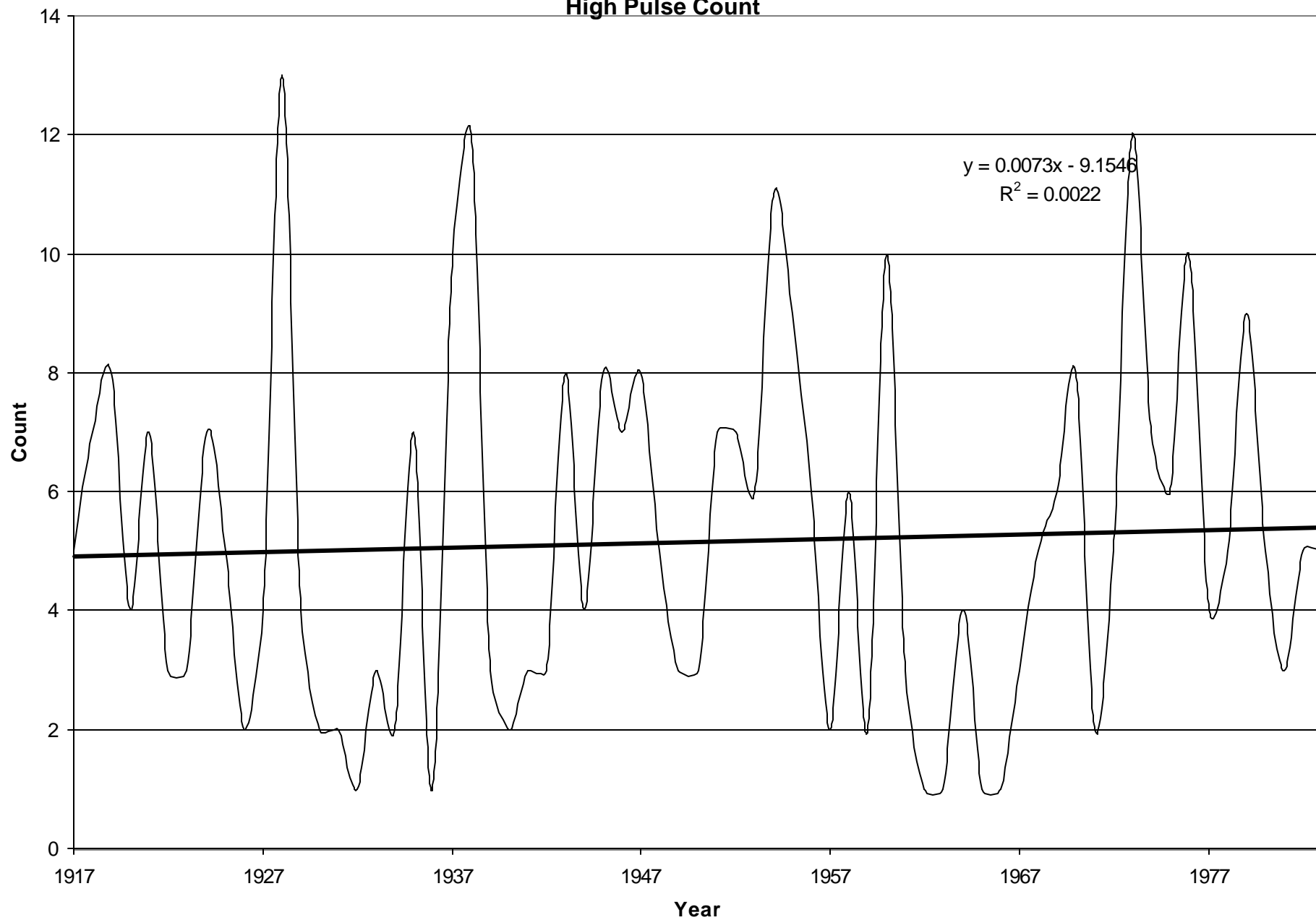




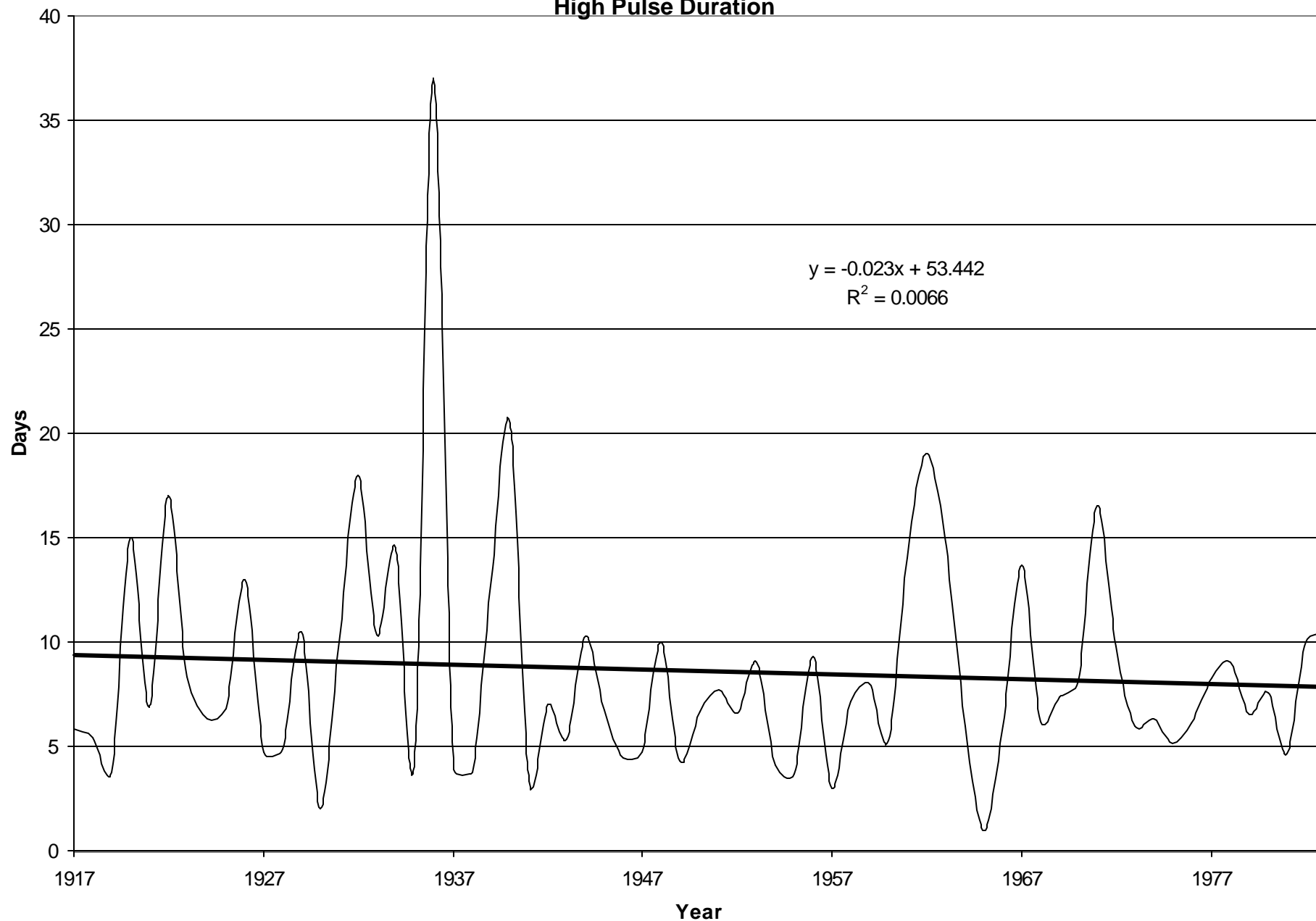
**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Low Pulse Duration**



**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**High Pulse Count**

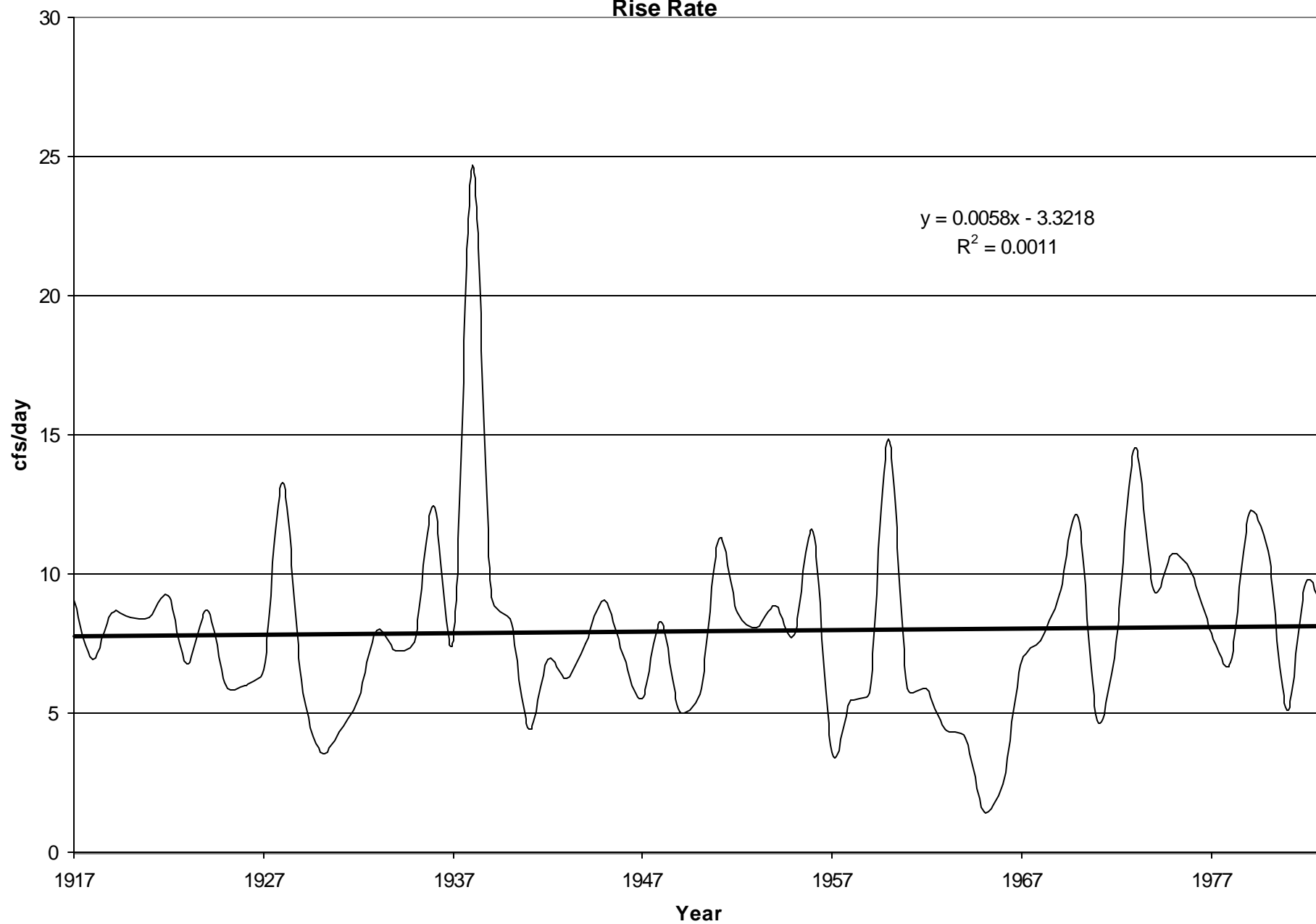


**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**High Pulse Duration**

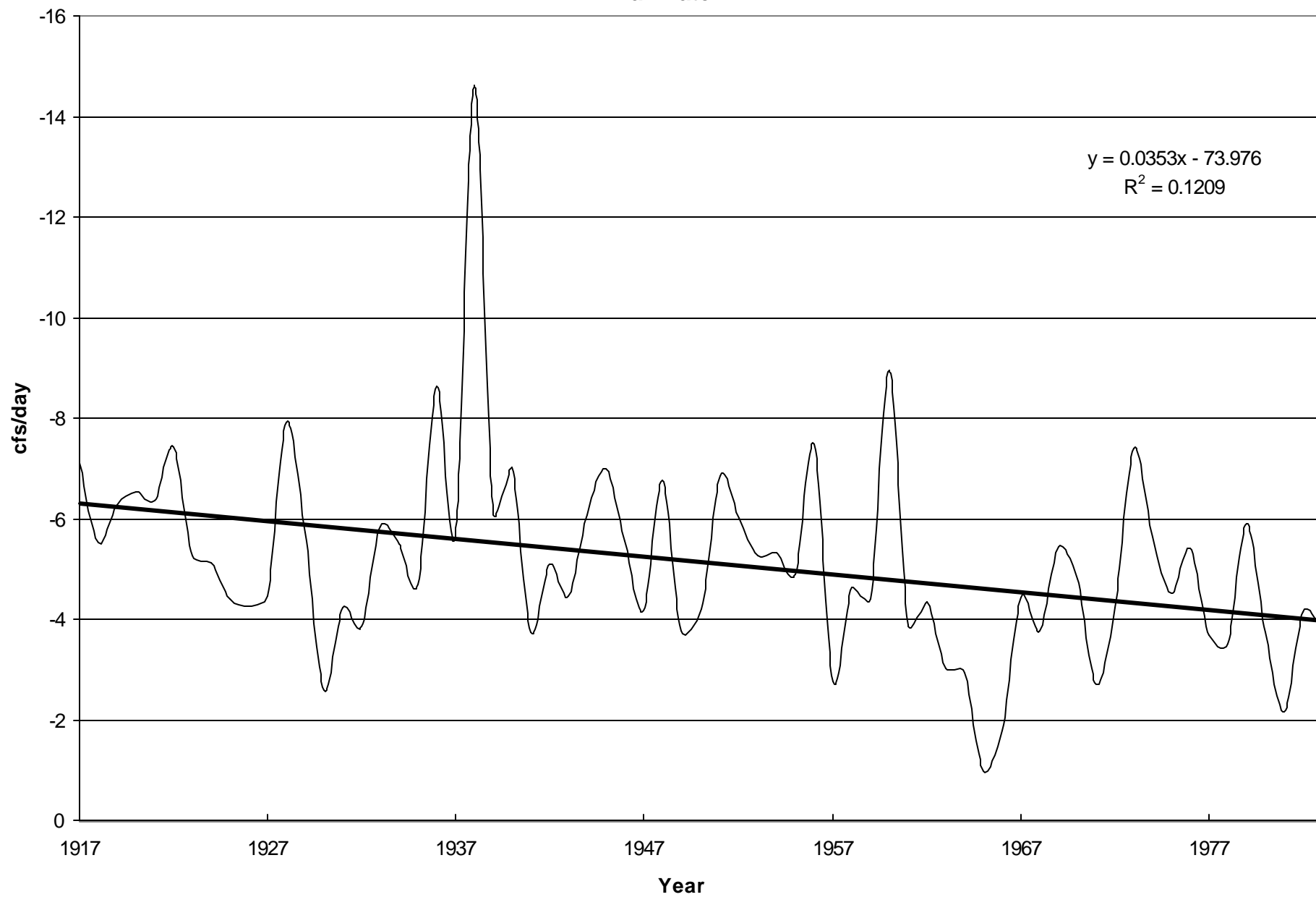


# Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi

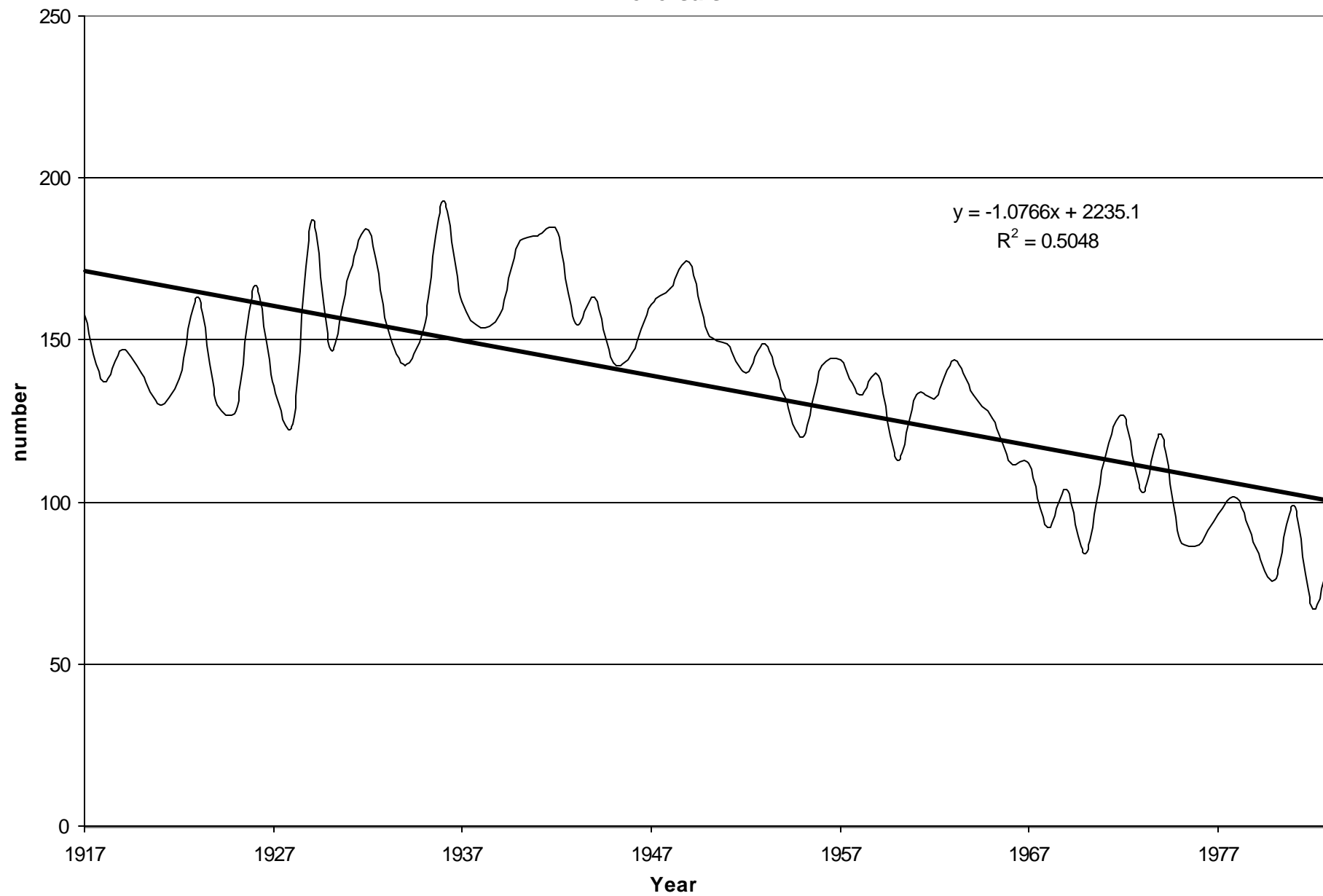
## Rise Rate



**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Fall Rate**



**Tarbell Brook near Winchendon, MA, Drainage Area=17.8 sq mi**  
**Reversals**

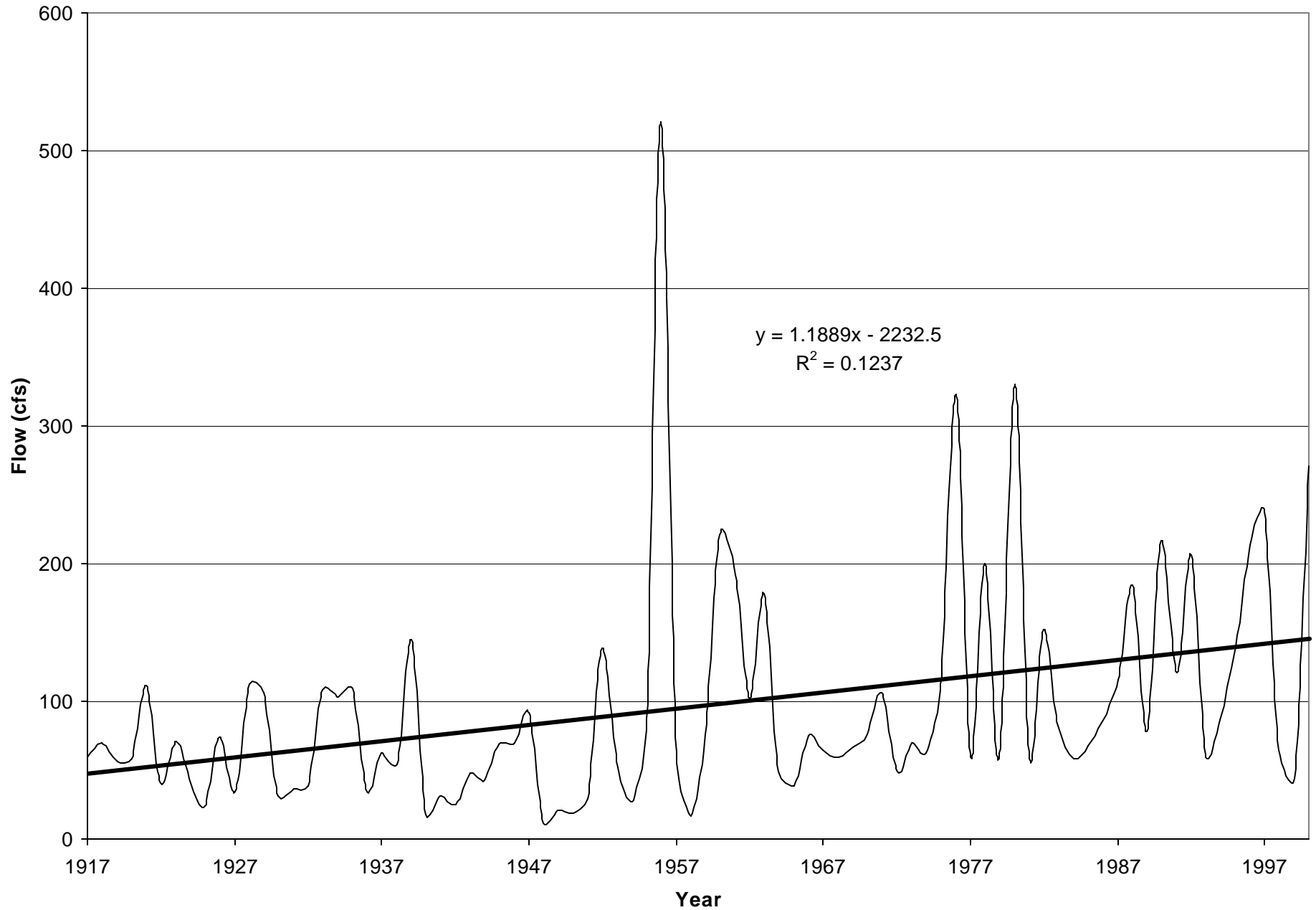


**Millers River near Winchendon, MA**  
**Drainage Area= 81.8 square miles**  
**Period of Record: Water Years 1917-2000**  
***IHA Results***

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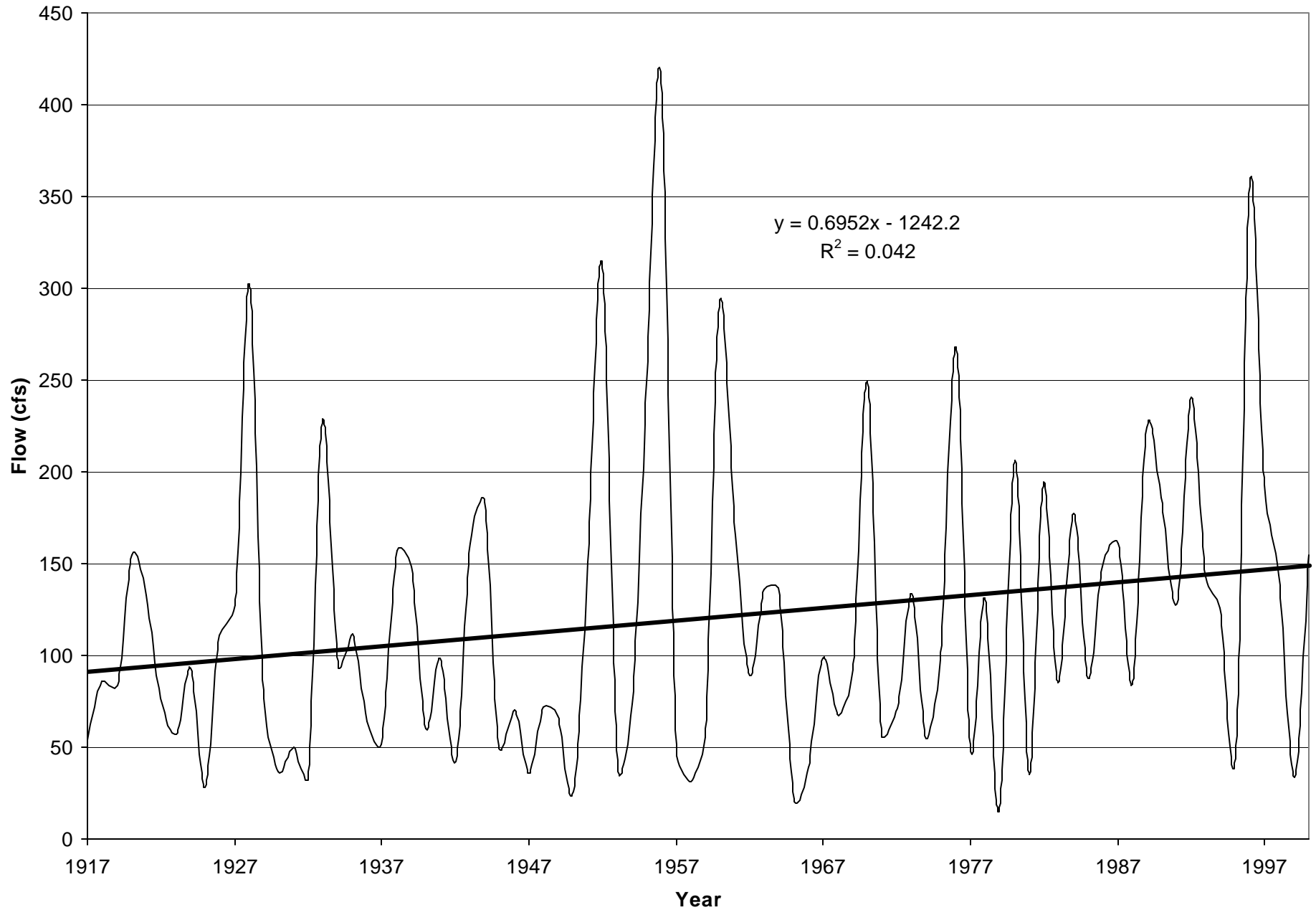
1. Average Monthly Flow for October
2. Average Monthly Flow for November
3. Average Monthly Flow for December
4. Average Monthly Flow for January
5. Average Monthly Flow for February
6. Average Monthly Flow for March
7. Average Monthly Flow for April
8. Average Monthly Flow for May
9. Average Monthly Flow for June
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12. Average Monthly Flow for September
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15. 7-Day Minimum Flow
16. 30-Day Minimum Flow
17. 90-Day Minimum Flow
18. 1-Day Maximum Flow
19. 3-Day Maximum Flow
20. 7-Day Maximum Flow
21. 30-Day Maximum Flow
22. 90-Day Maximum Flow
23. Zero Days
24. Base Flow
25. Julian Date of Annual 1-Day Minimum Flow
26. Julian Date of Annual 1-Day Maximum Flow
27. Low Pulse Count
28. Low Pulse Duration
29. High Pulse Count
30. High Pulse Duration
31. Rise Rate
32. Fall Rate
33. Reversals

**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for October**

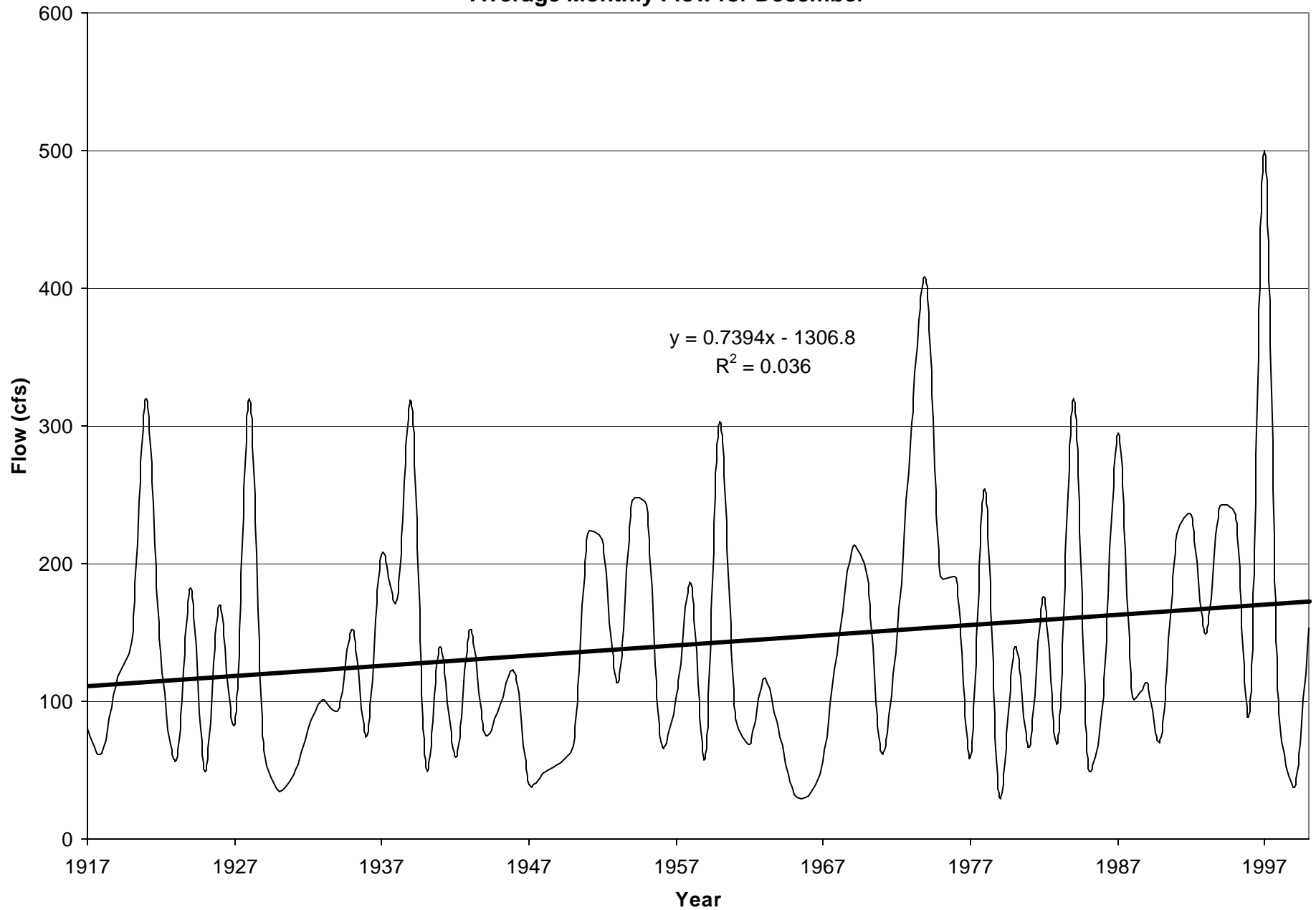




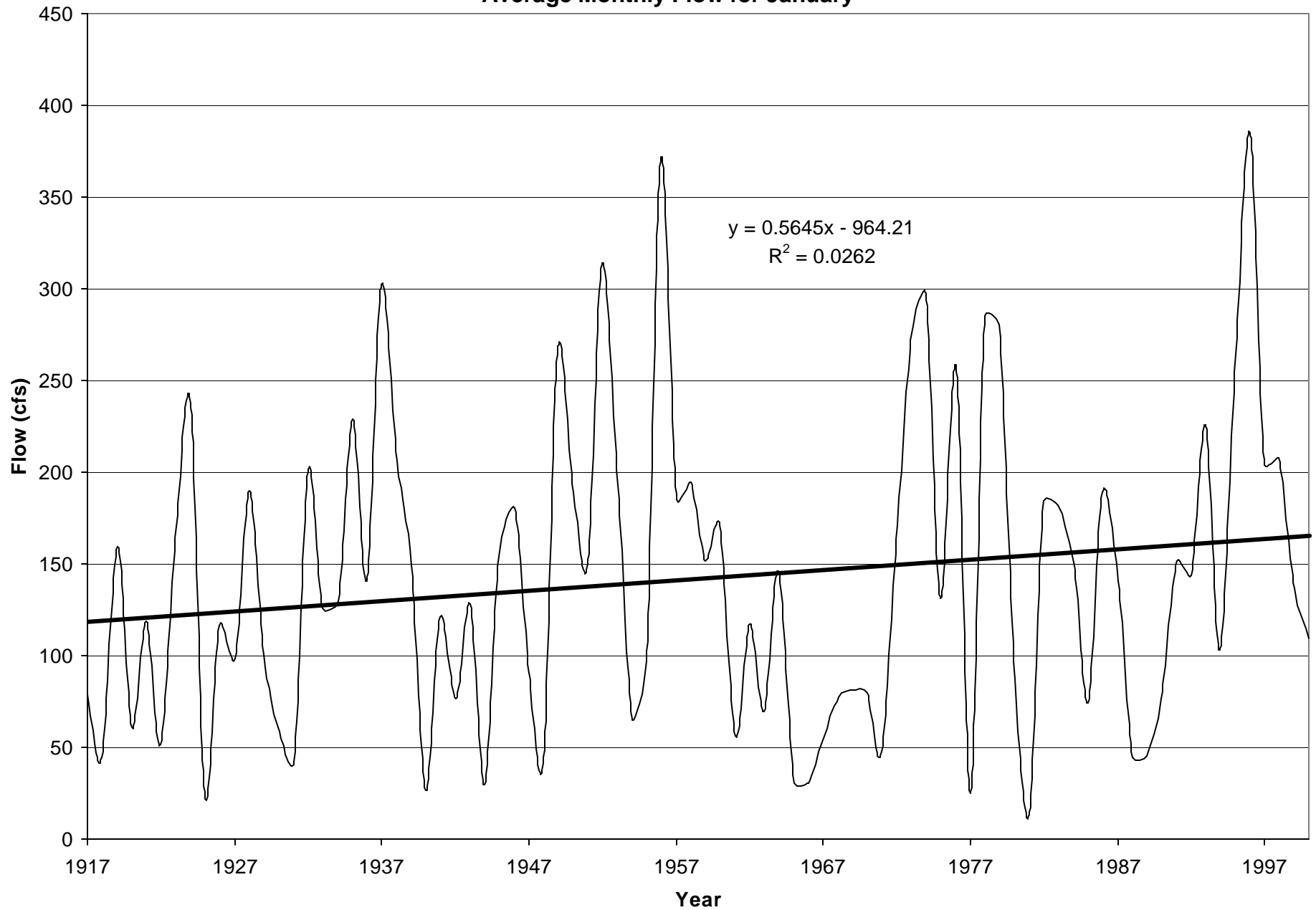
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for November**



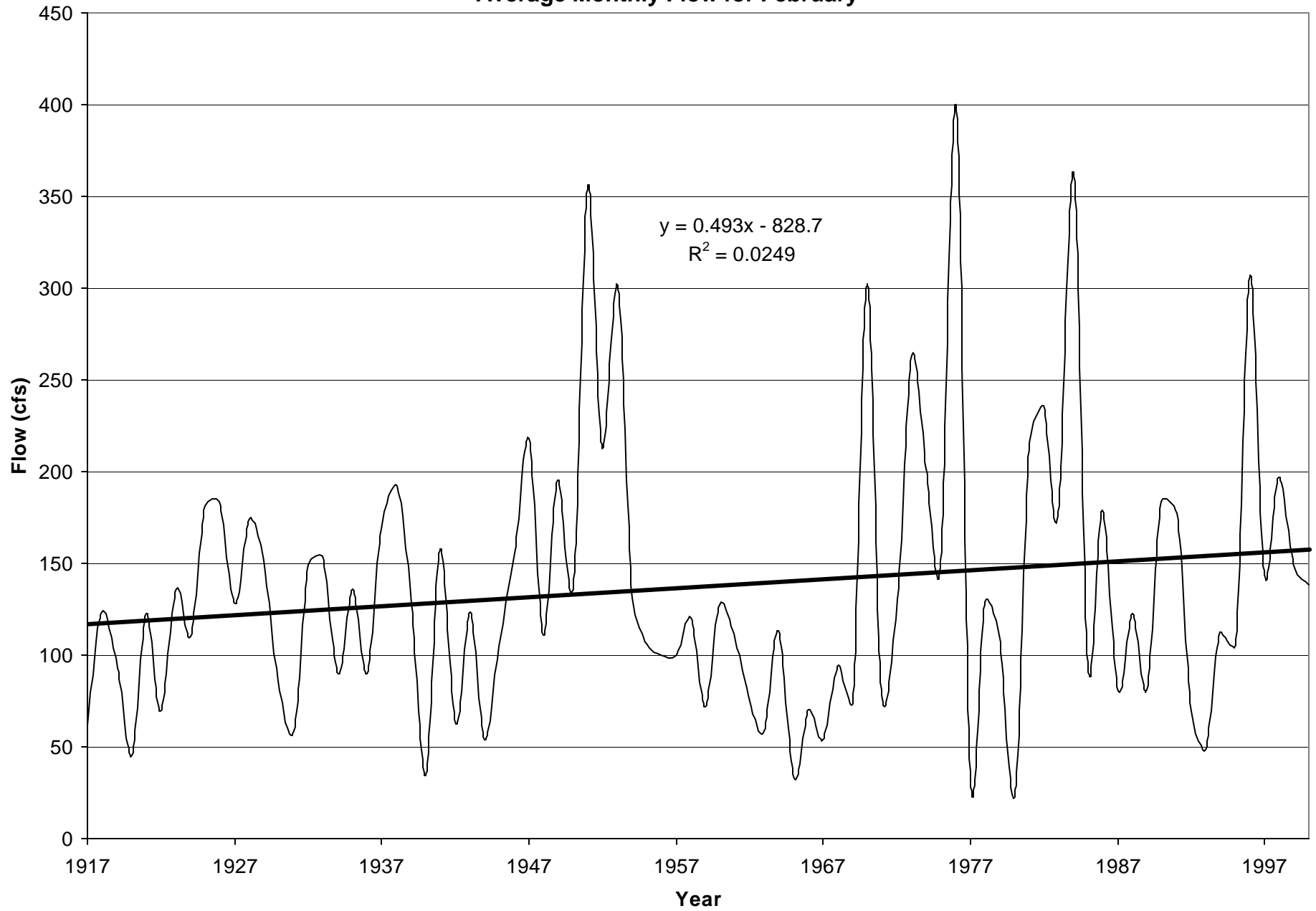
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for December**



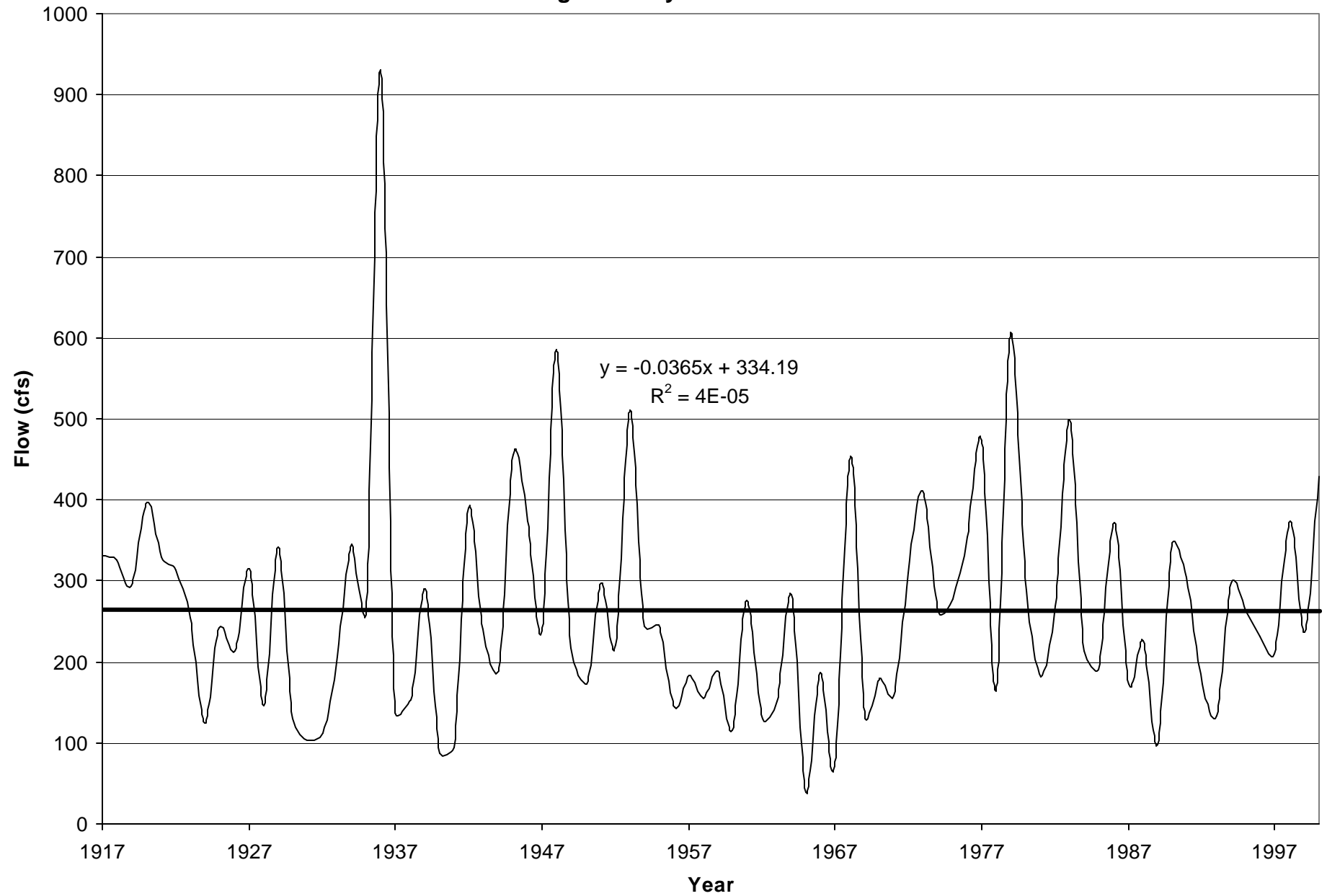
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for January**



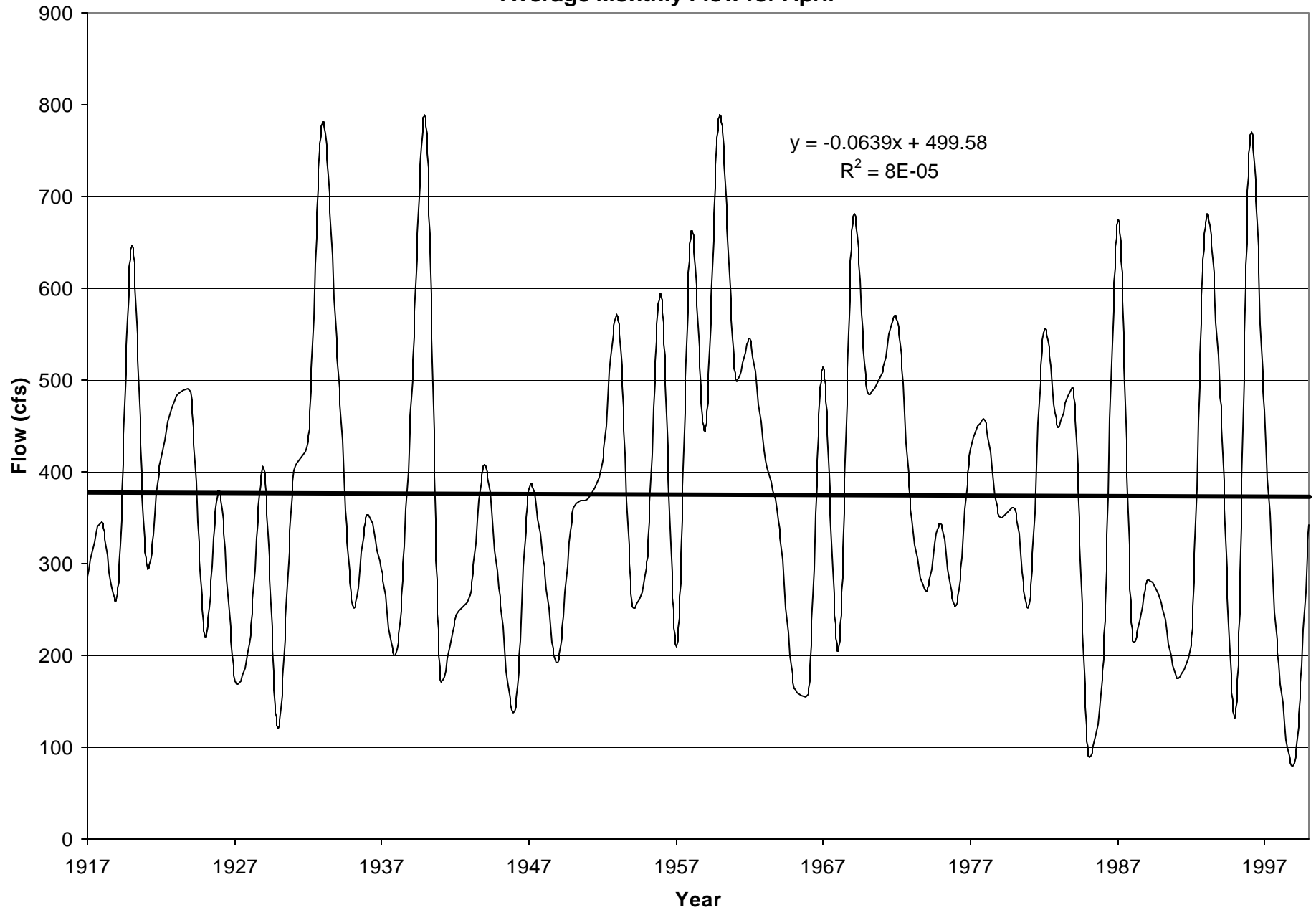
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for February**



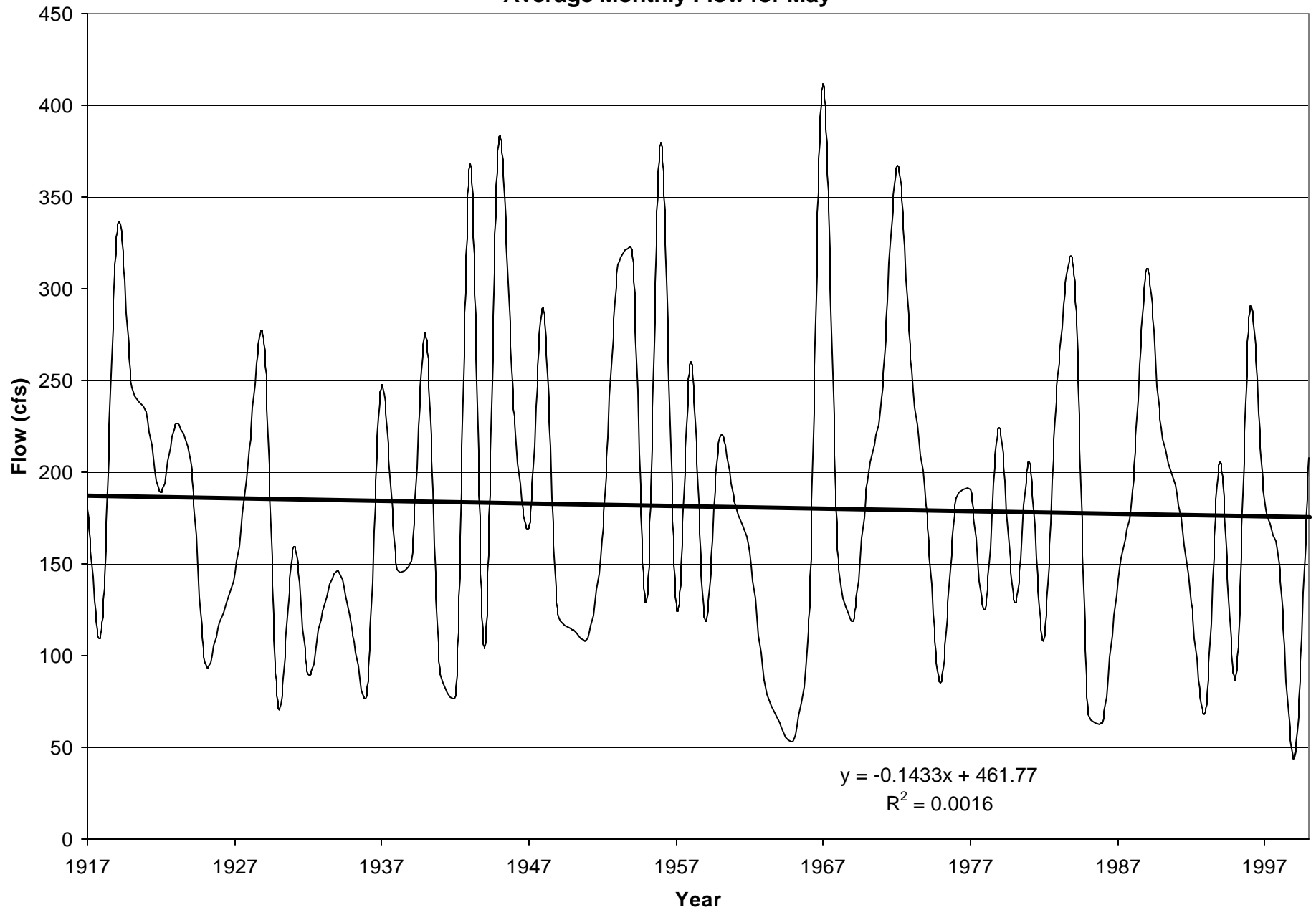
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for March**



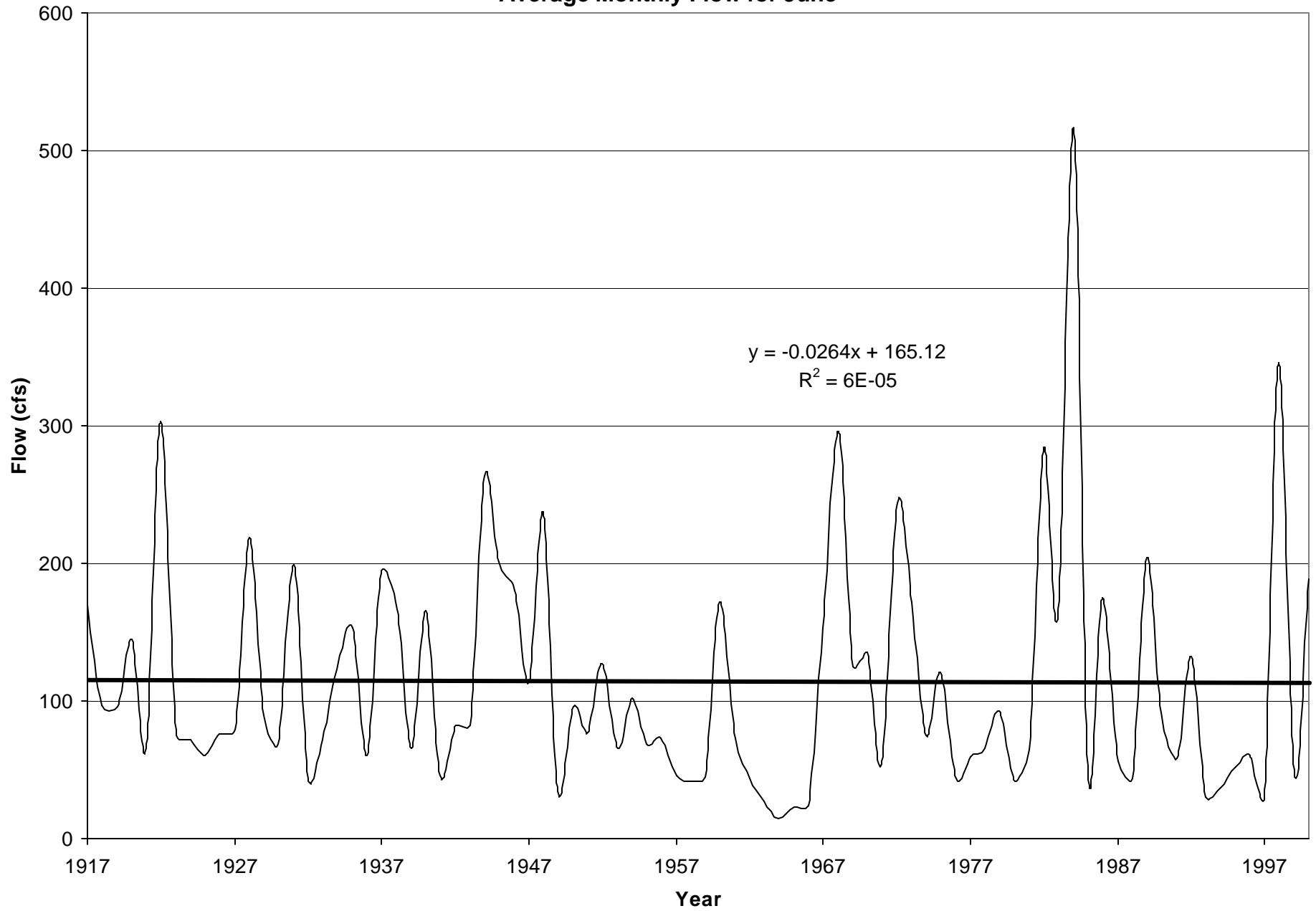
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for April**



**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for May**

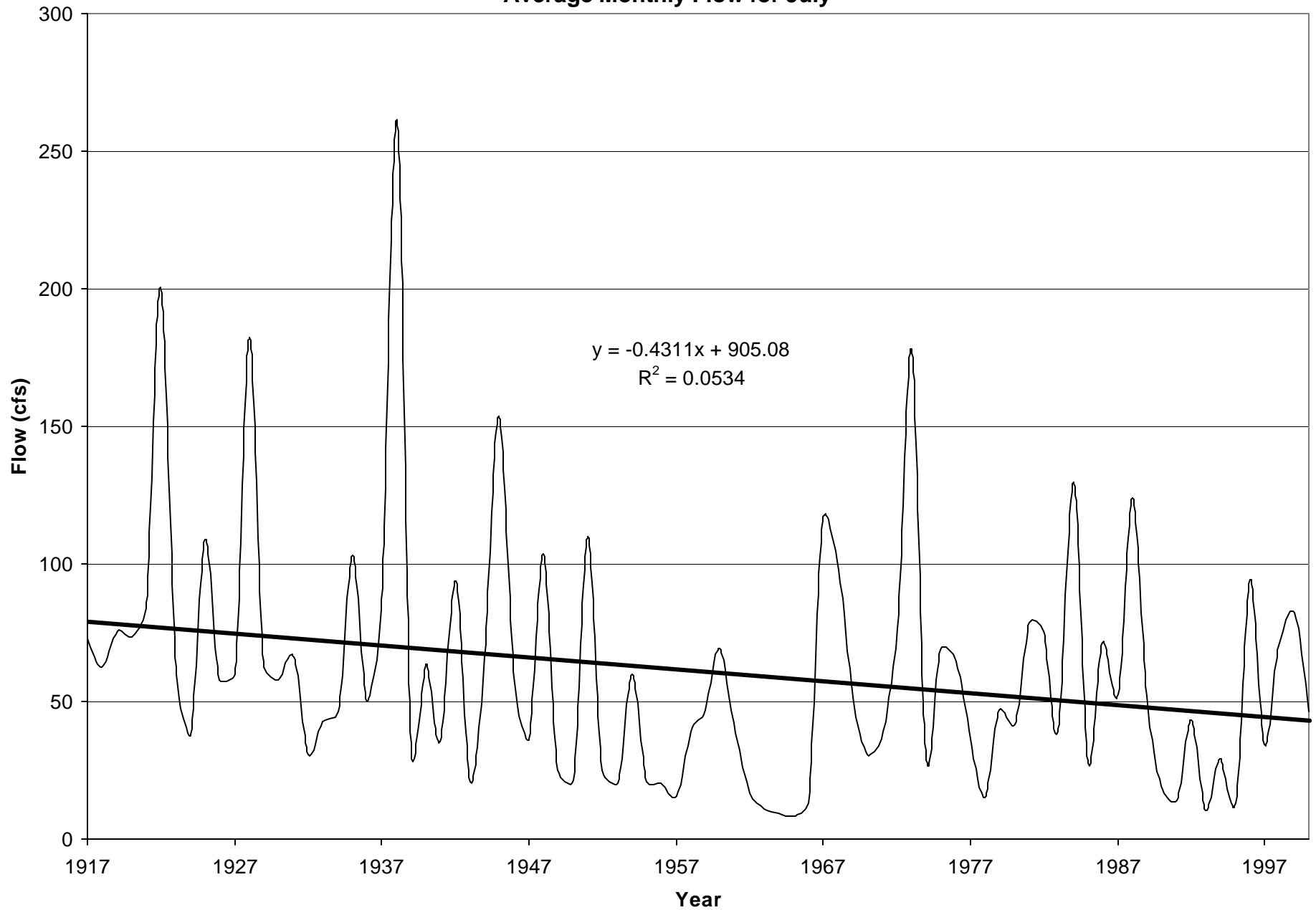


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for June**

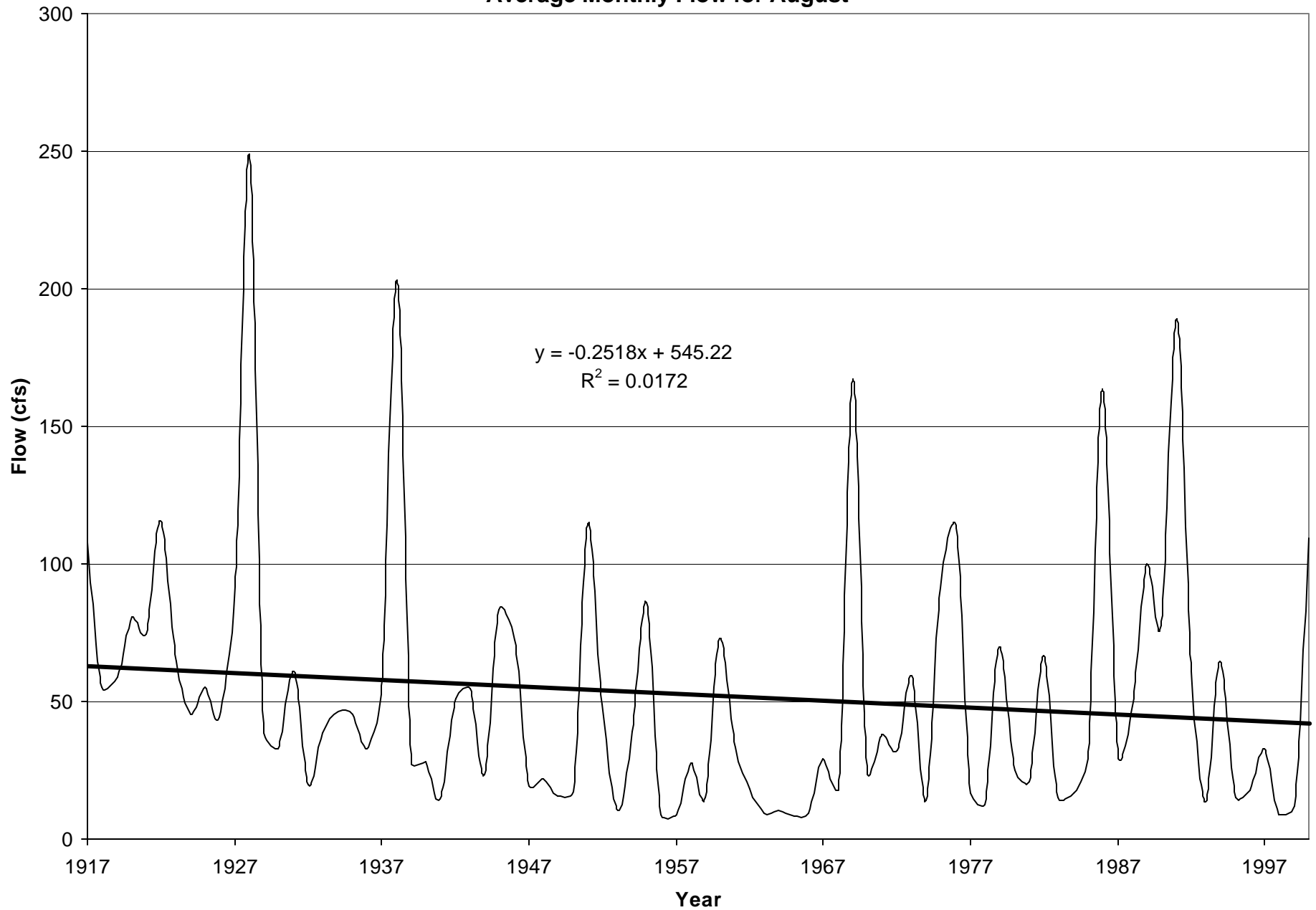




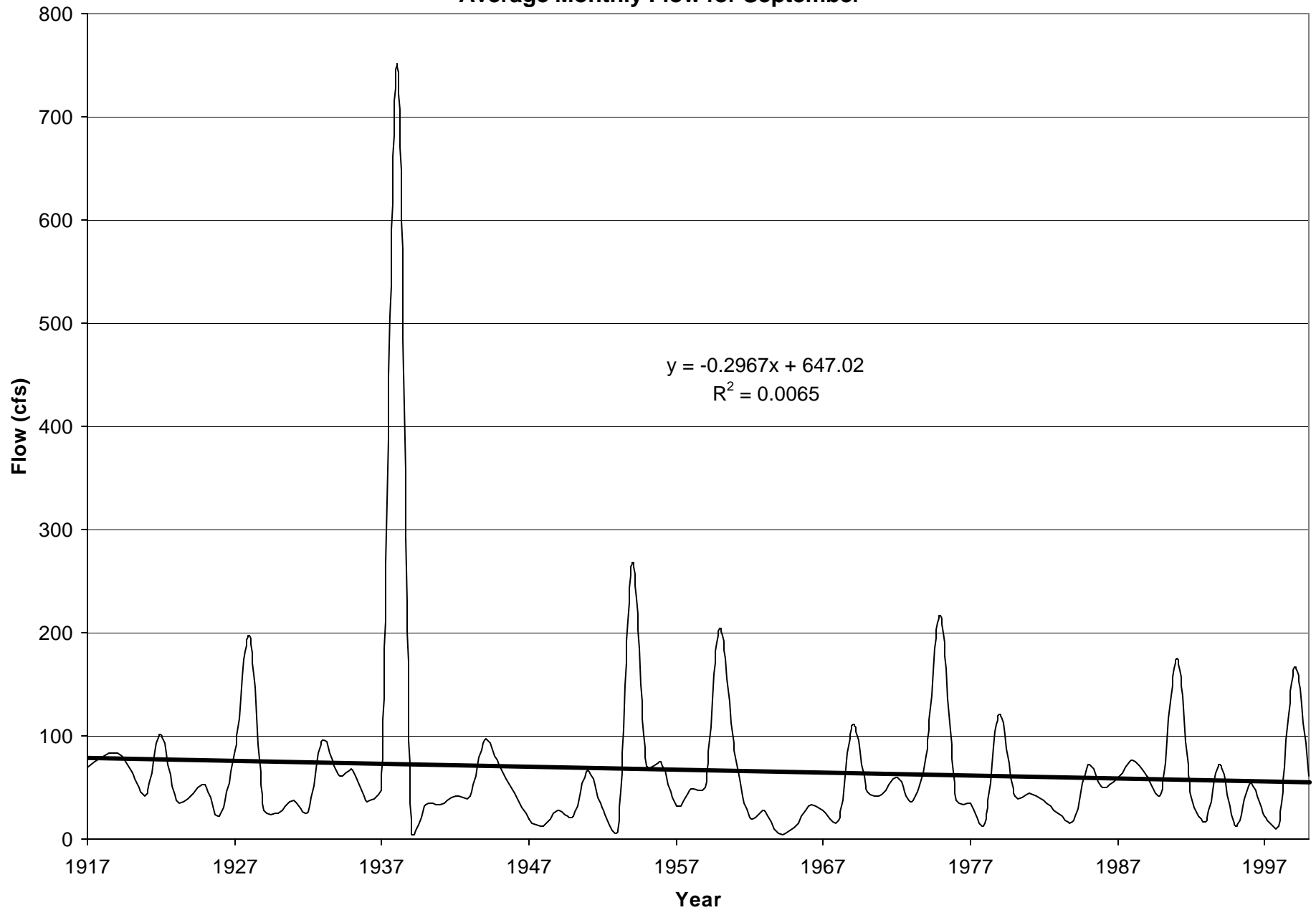
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for July**



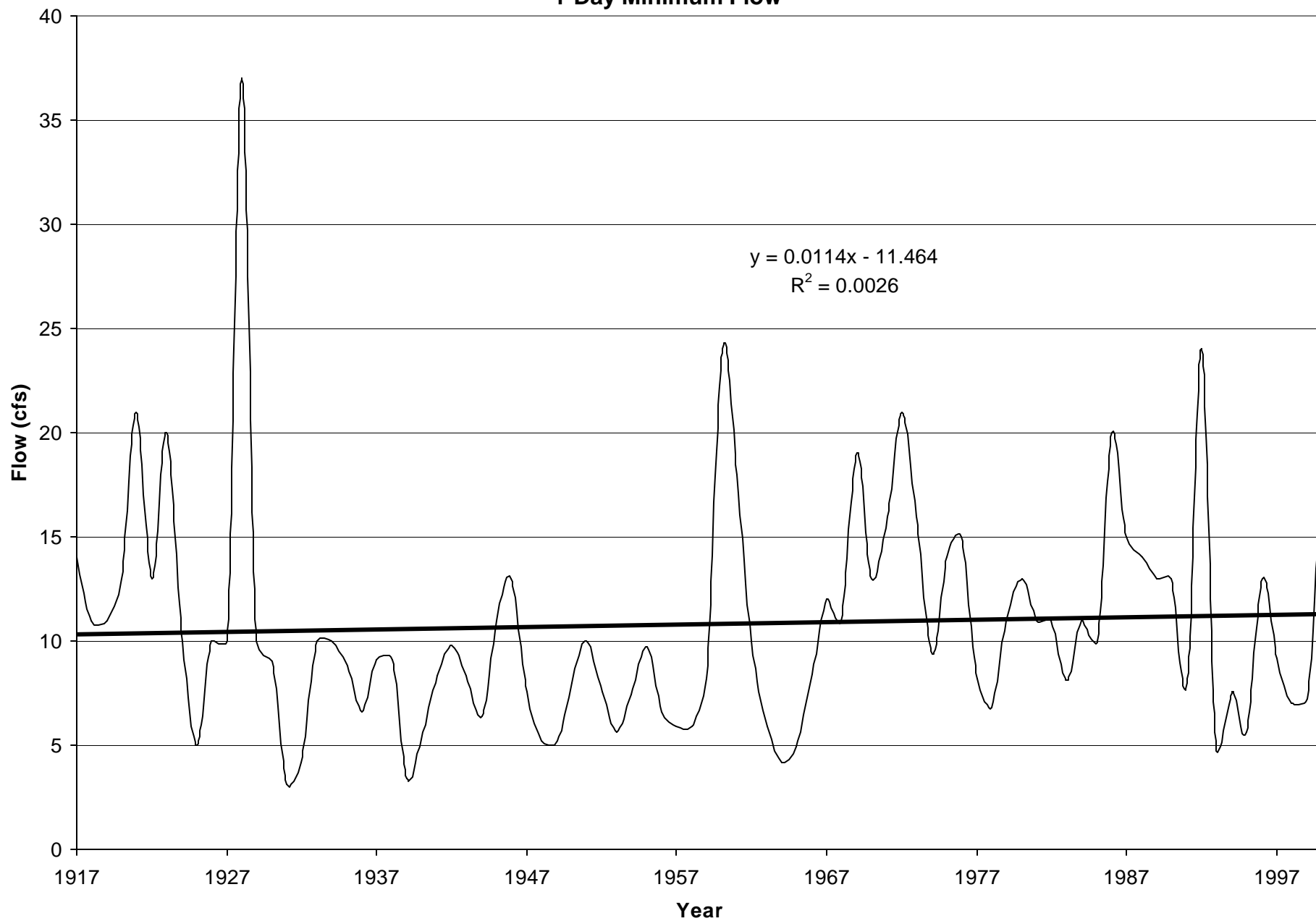
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for August**



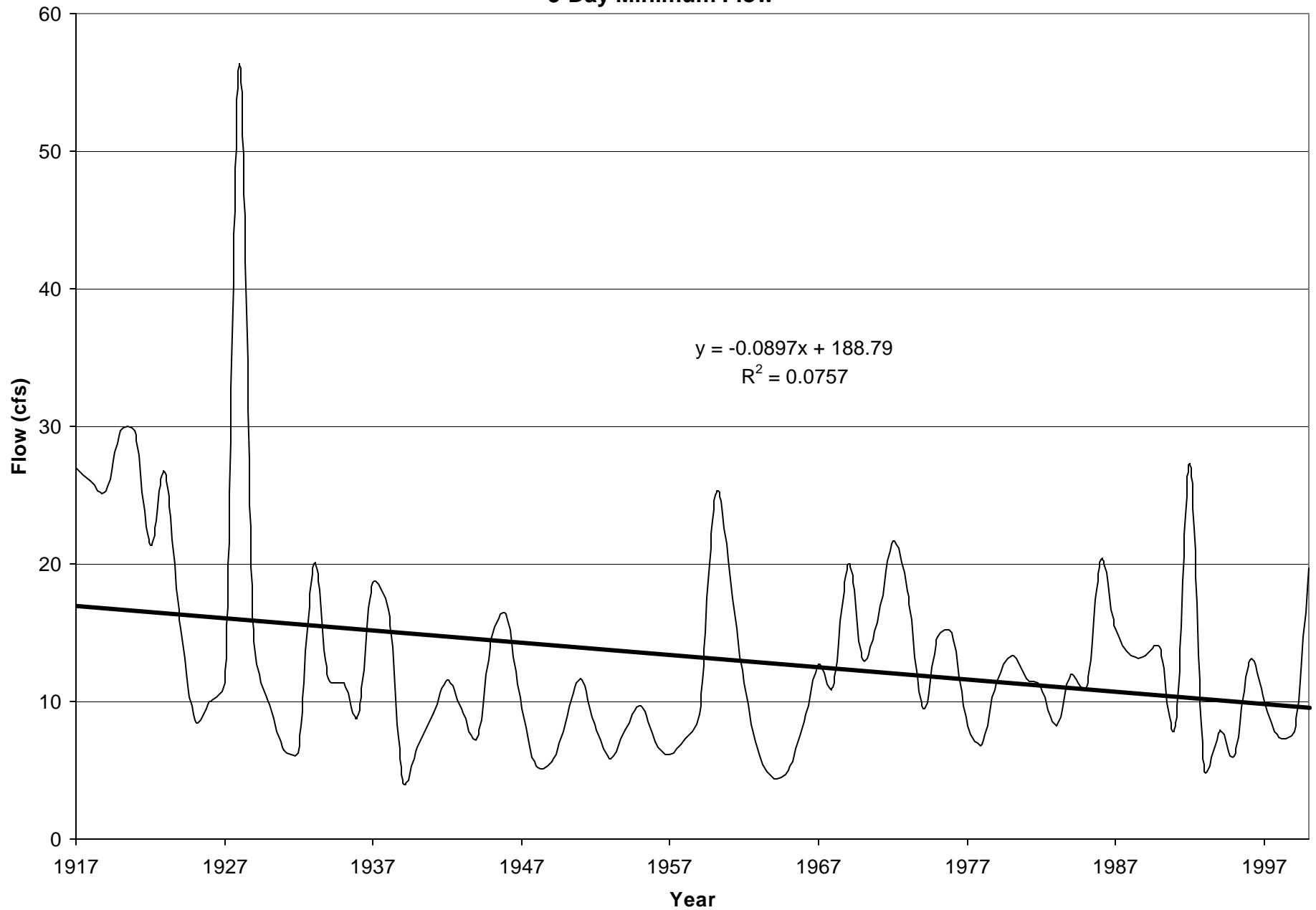
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Average Monthly Flow for September**



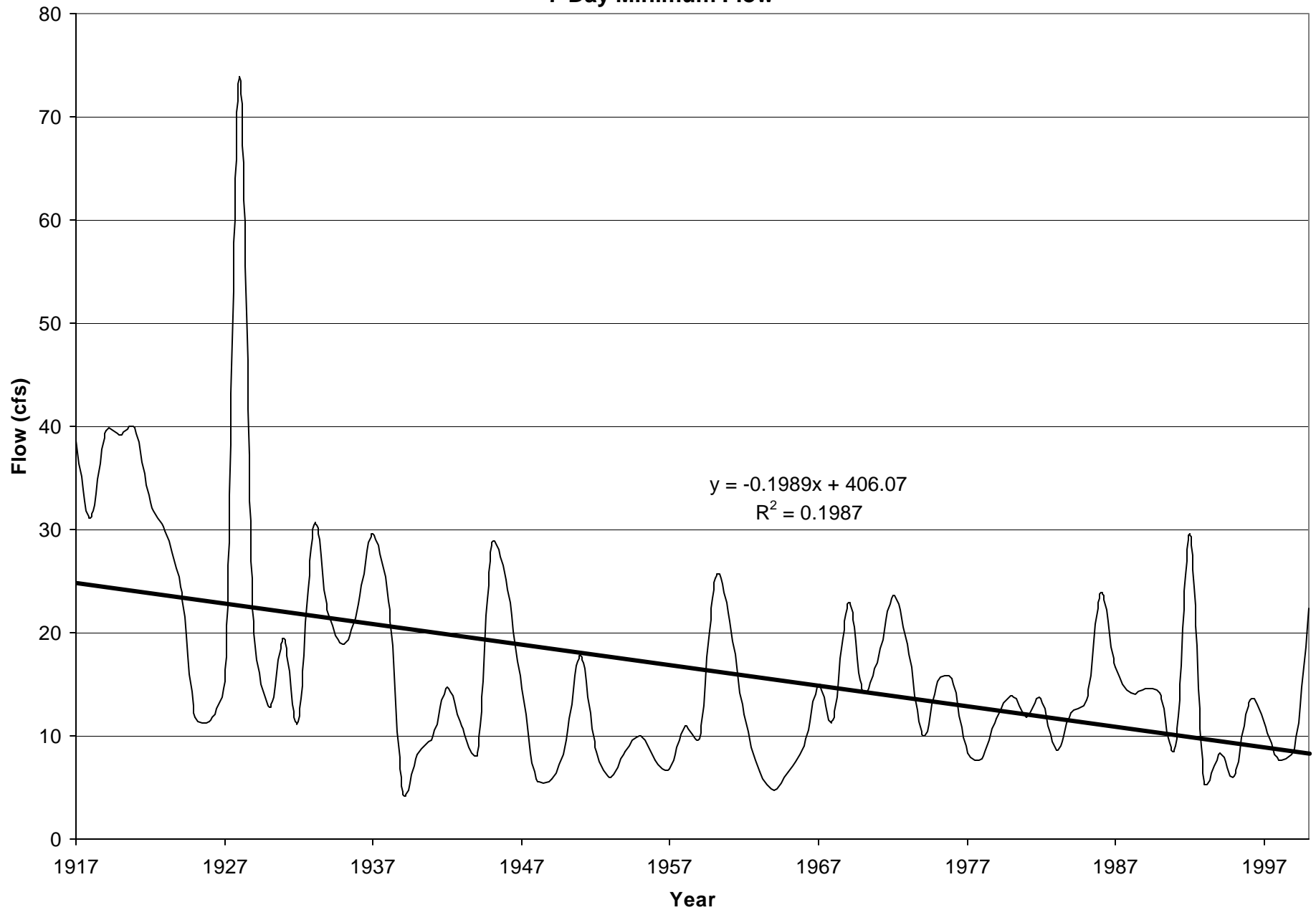
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**1-Day Minimum Flow**



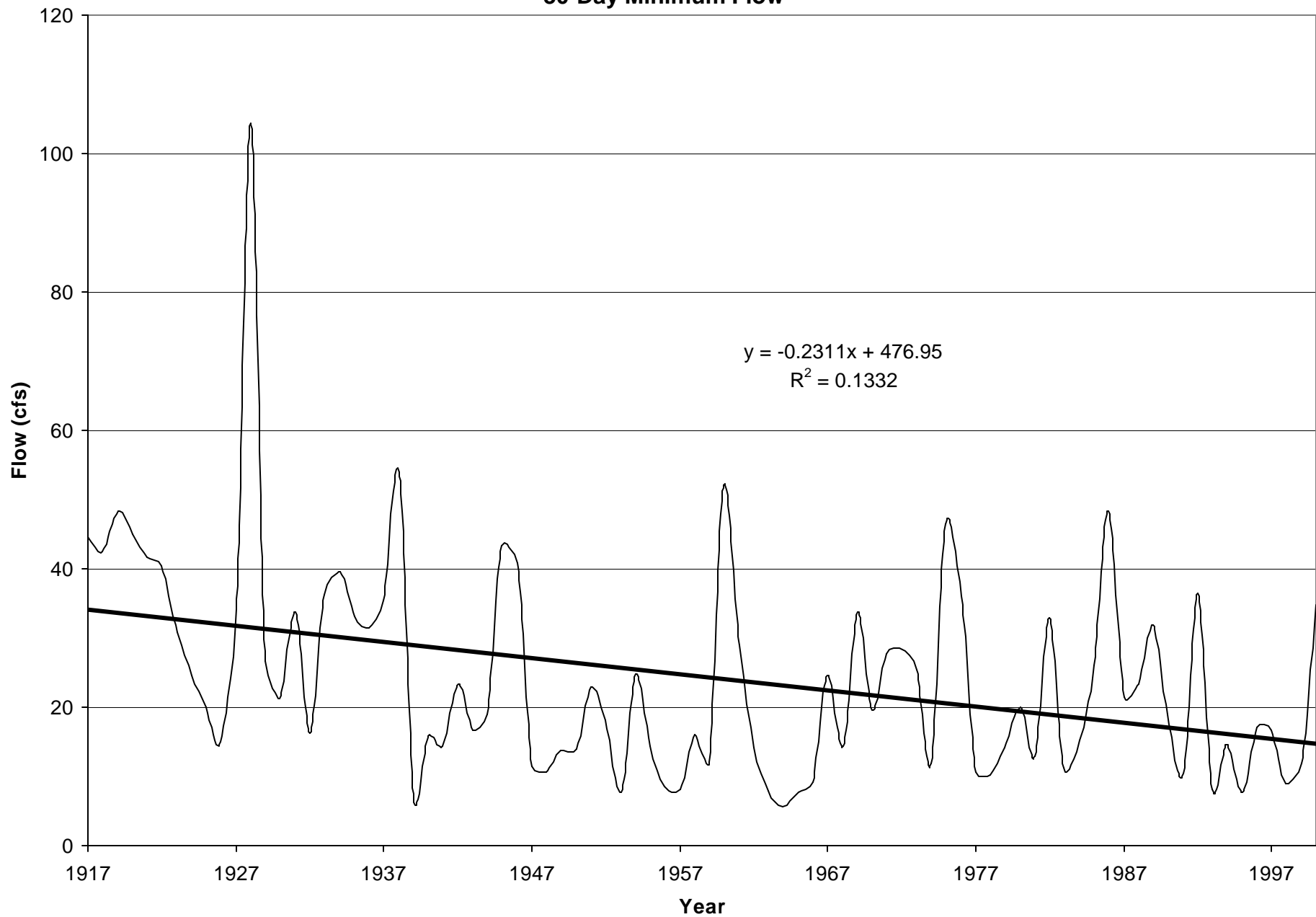
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**3-Day Minimum Flow**



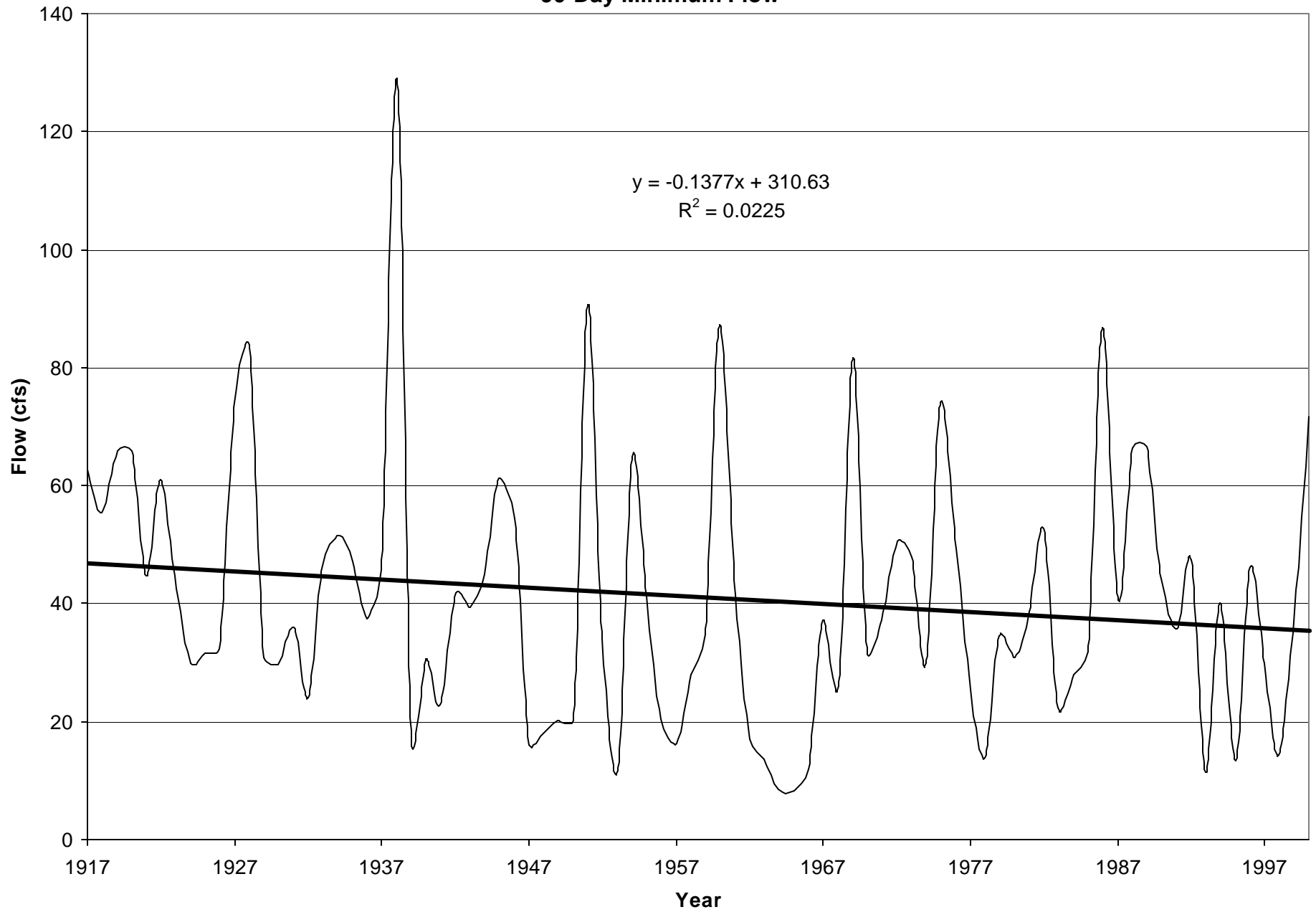
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**7-Day Minimum Flow**



**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**30-Day Minimum Flow**

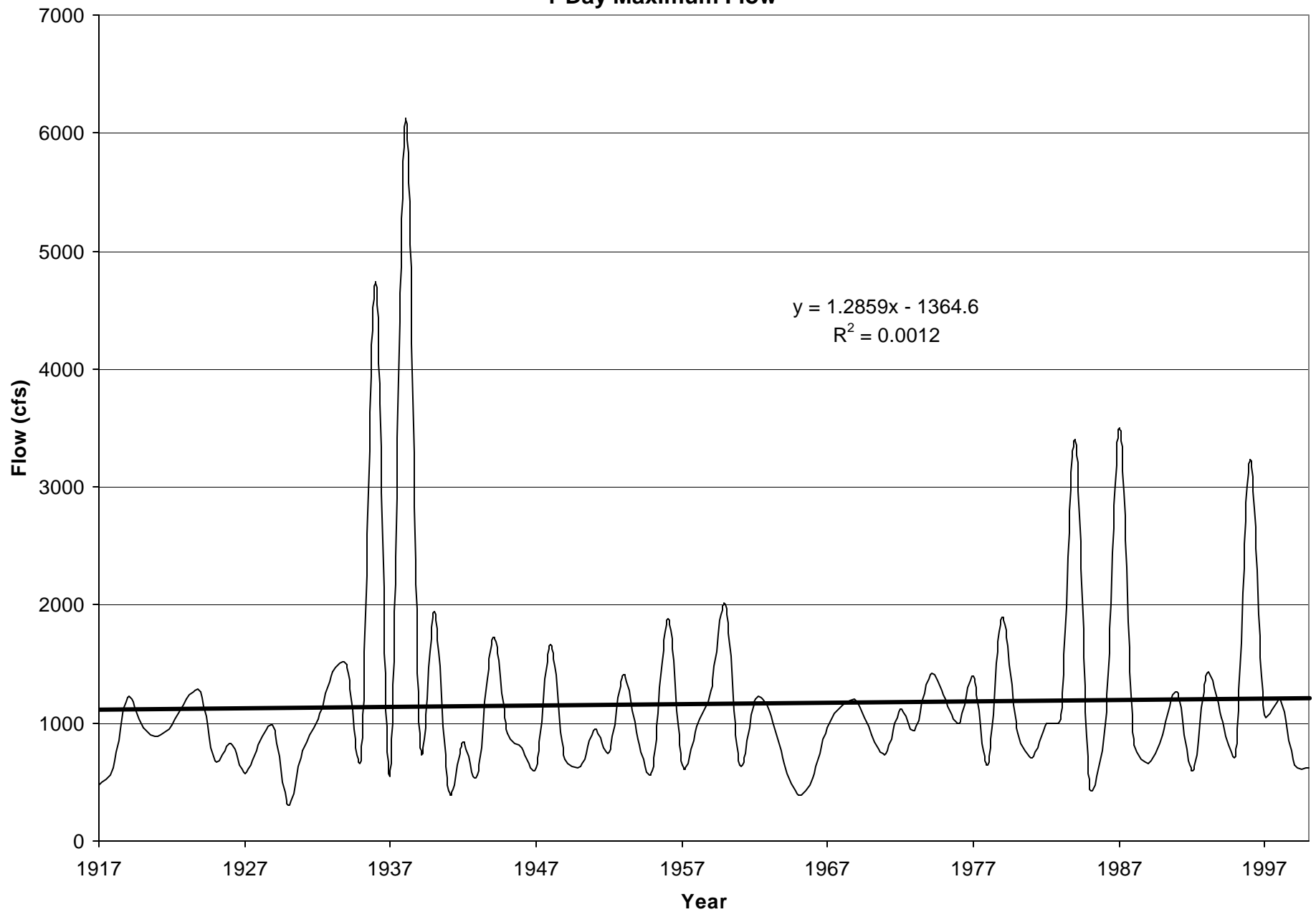


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**90-Day Minimum Flow**

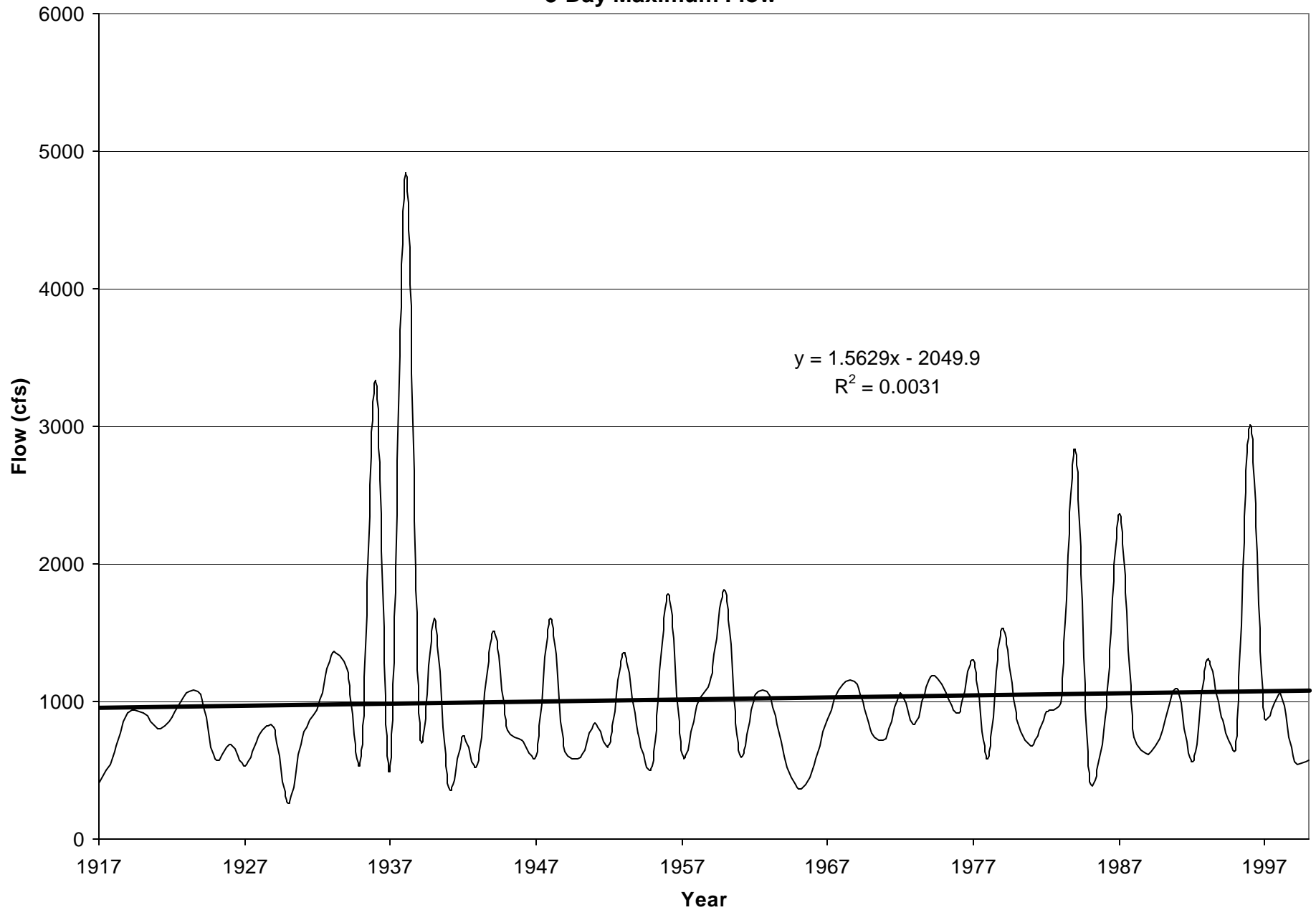




**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**1-Day Maximum Flow**

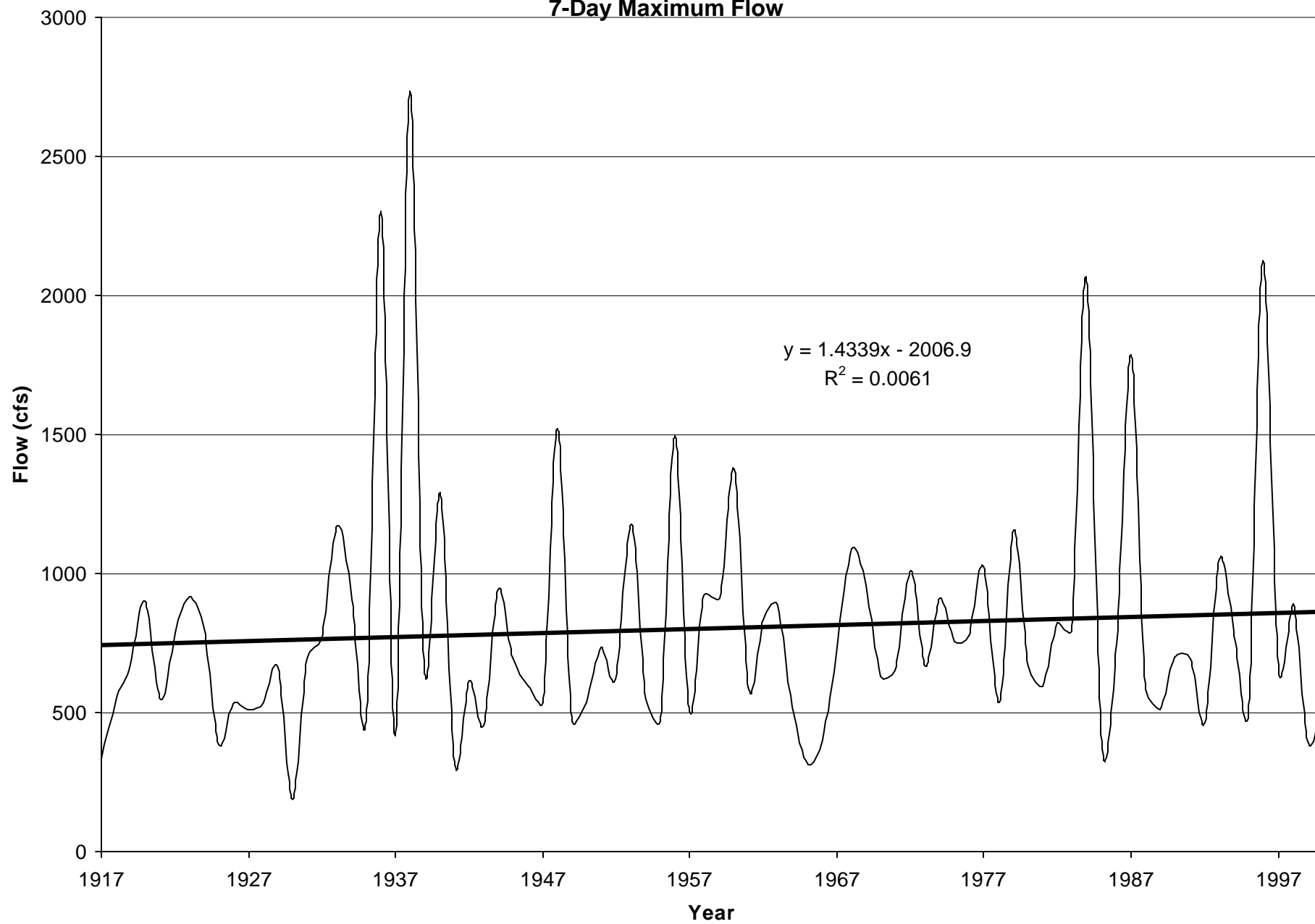


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**3-Day Maximum Flow**

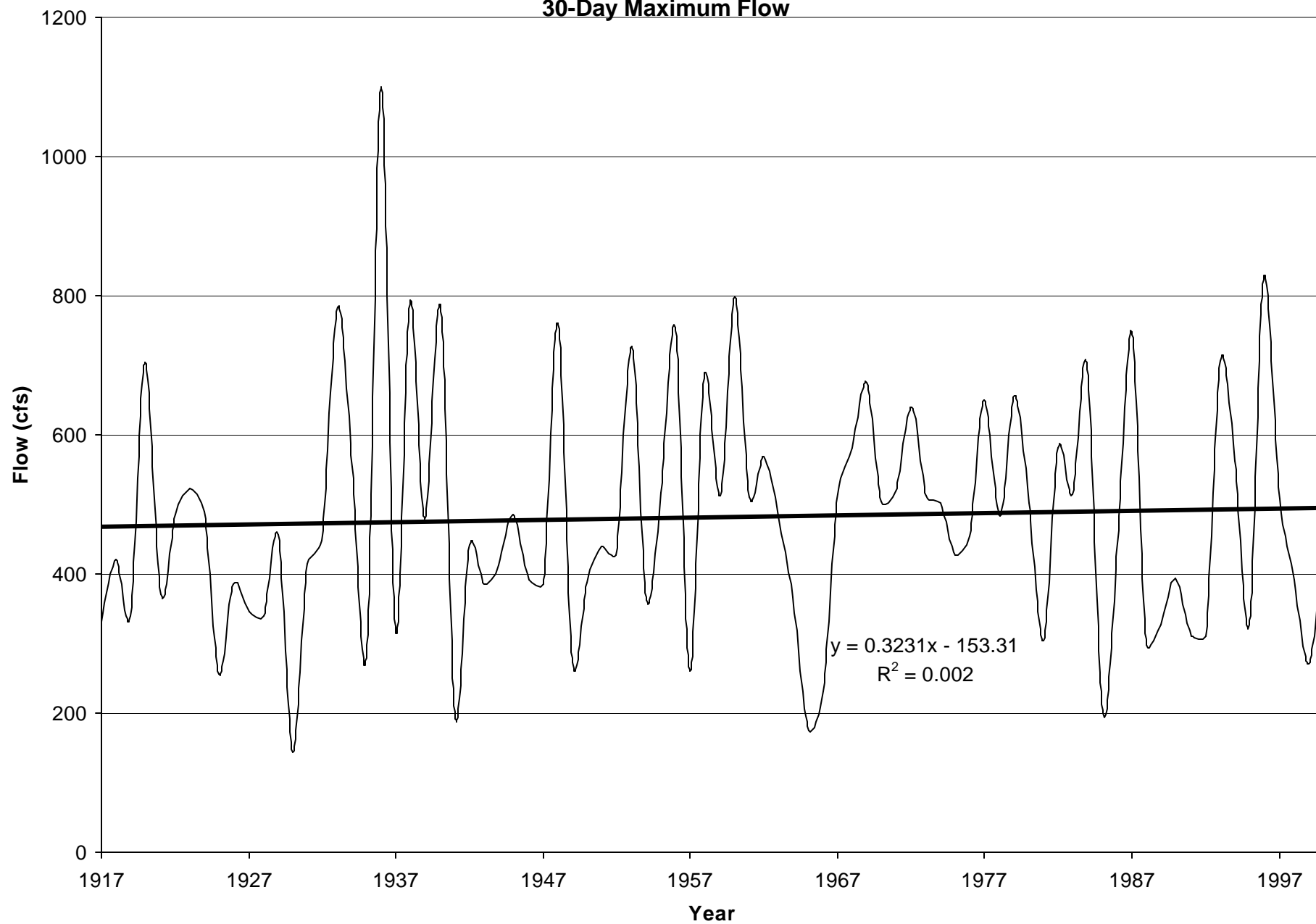


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**

**7-Day Maximum Flow**

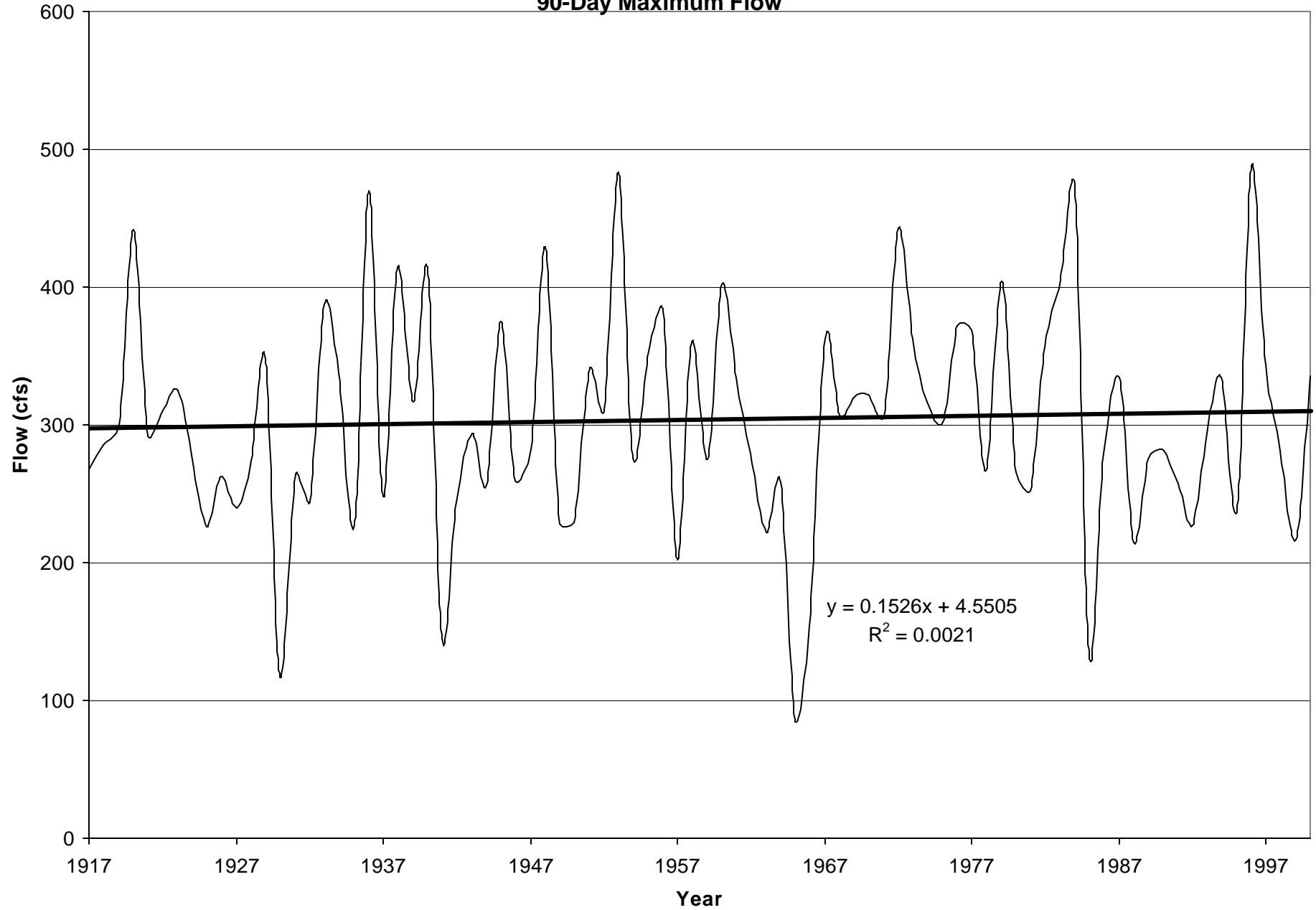


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**30-Day Maximum Flow**

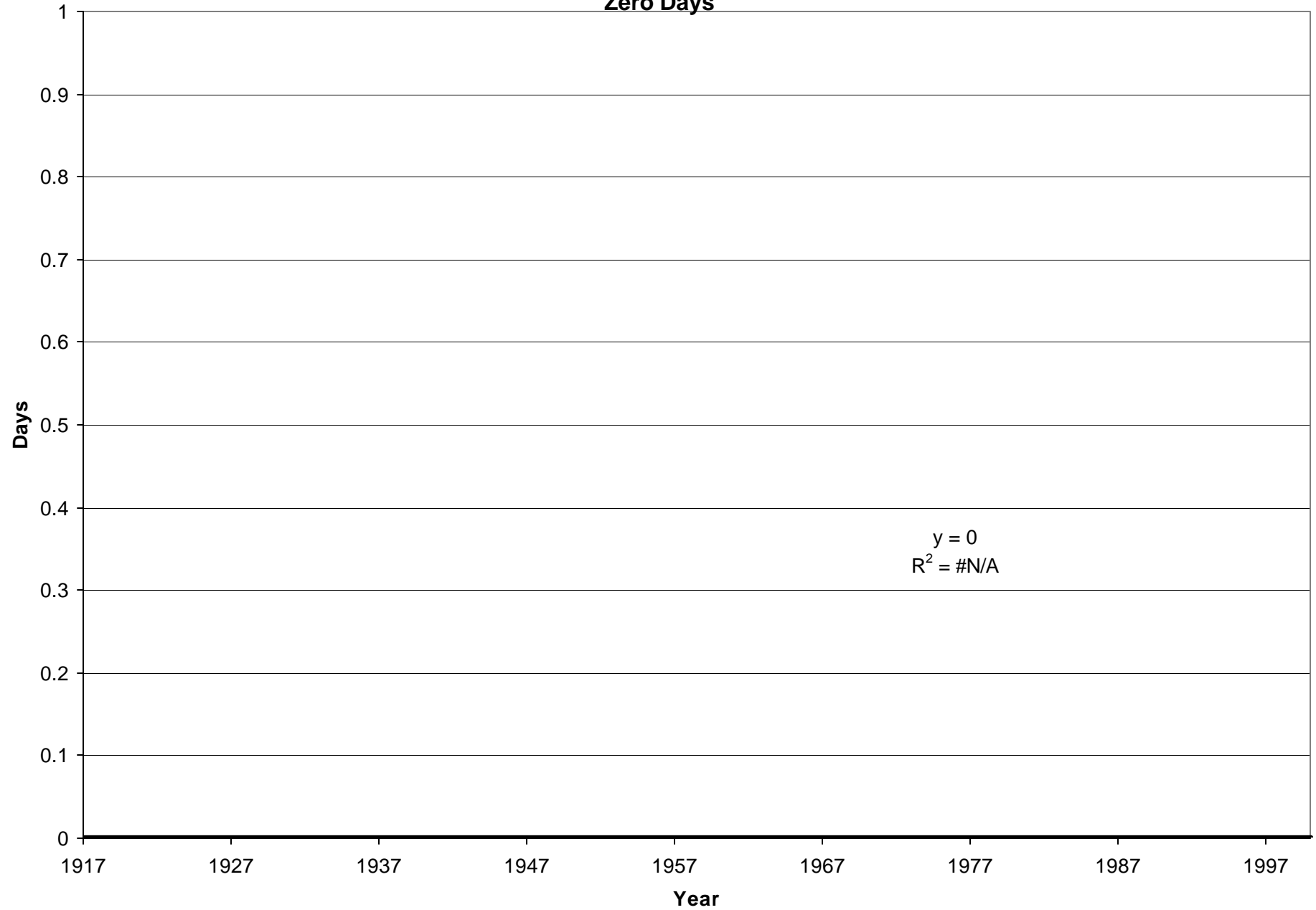


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**

**90-Day Maximum Flow**

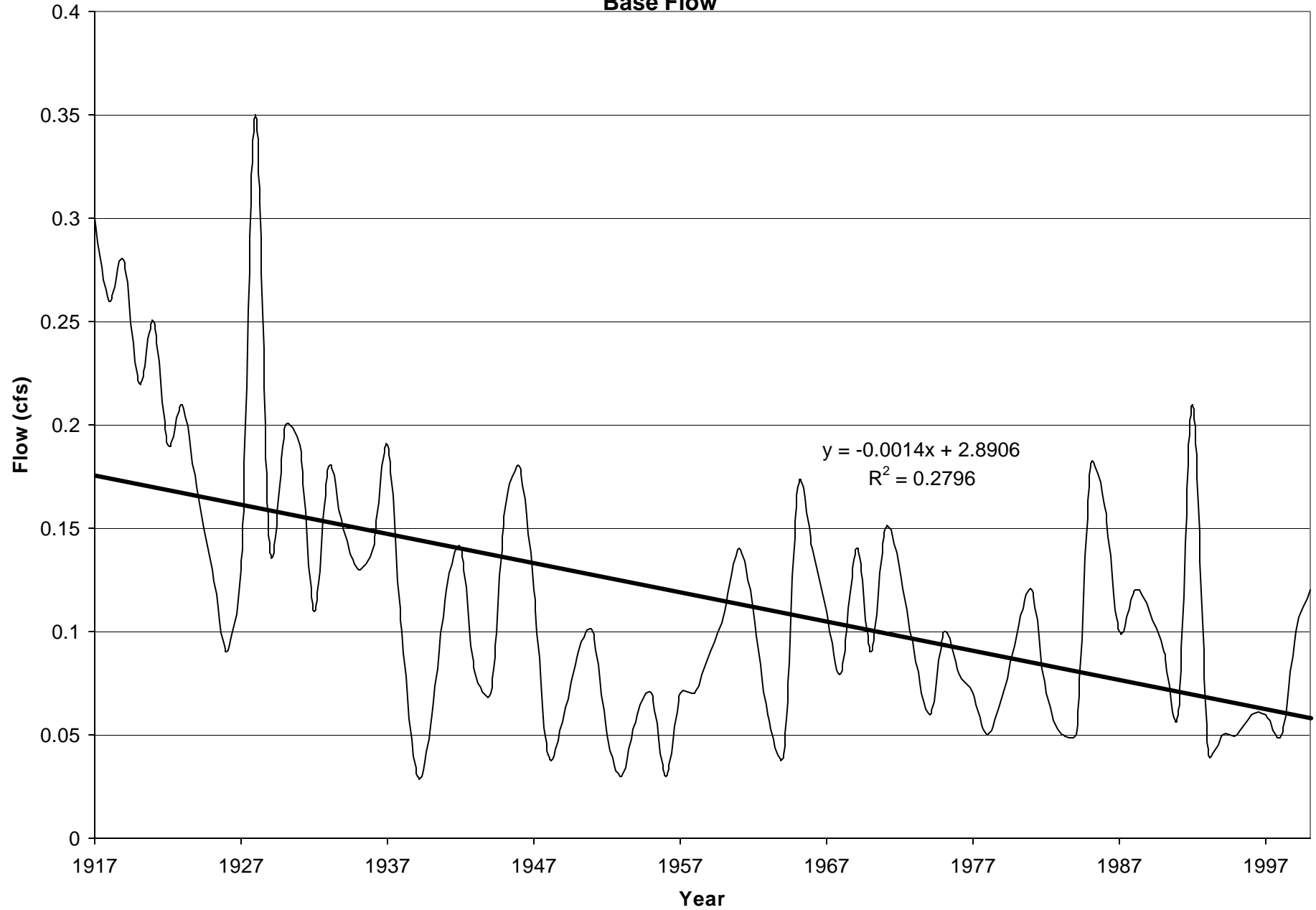


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Zero Days**

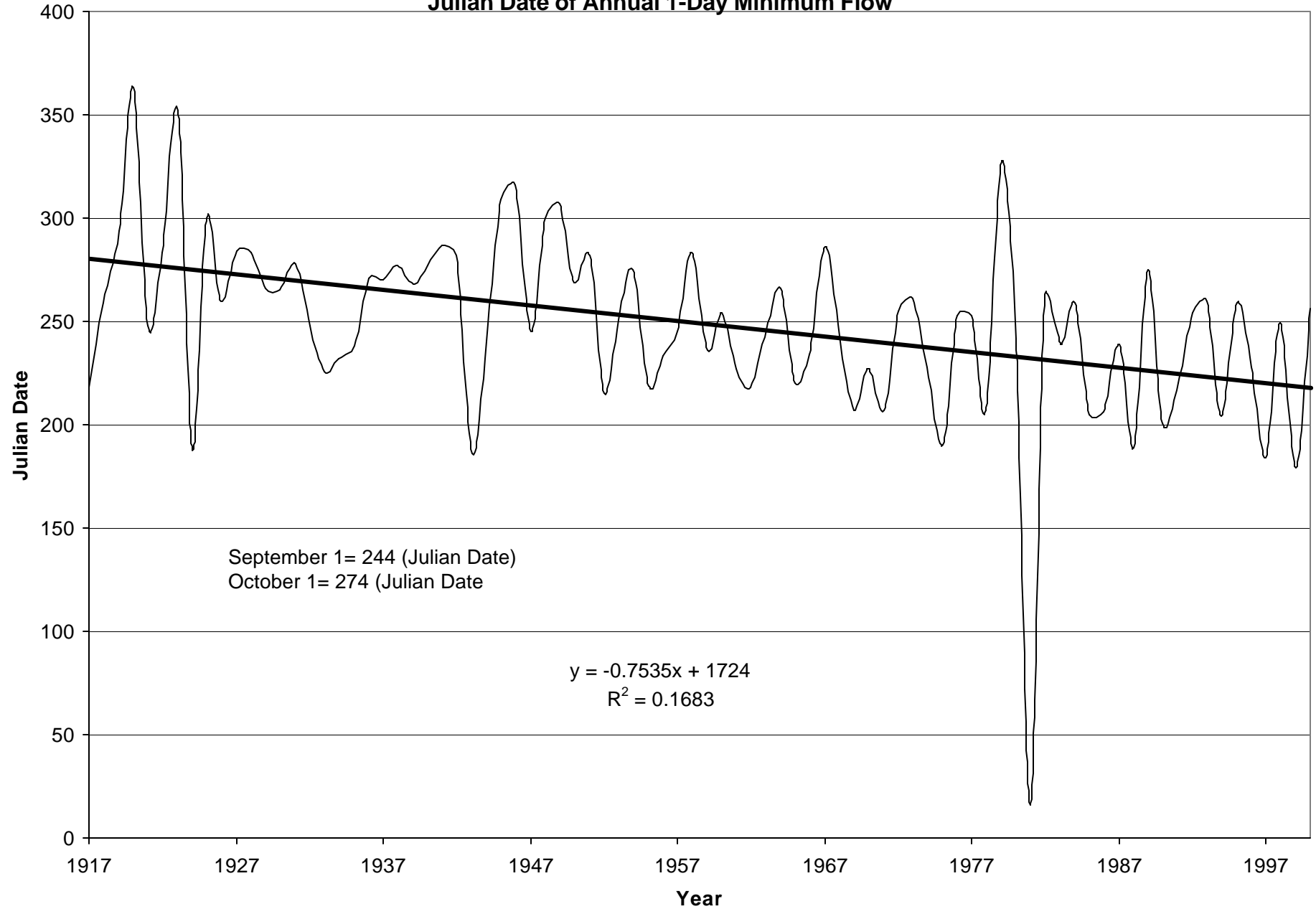


Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi

Base Flow

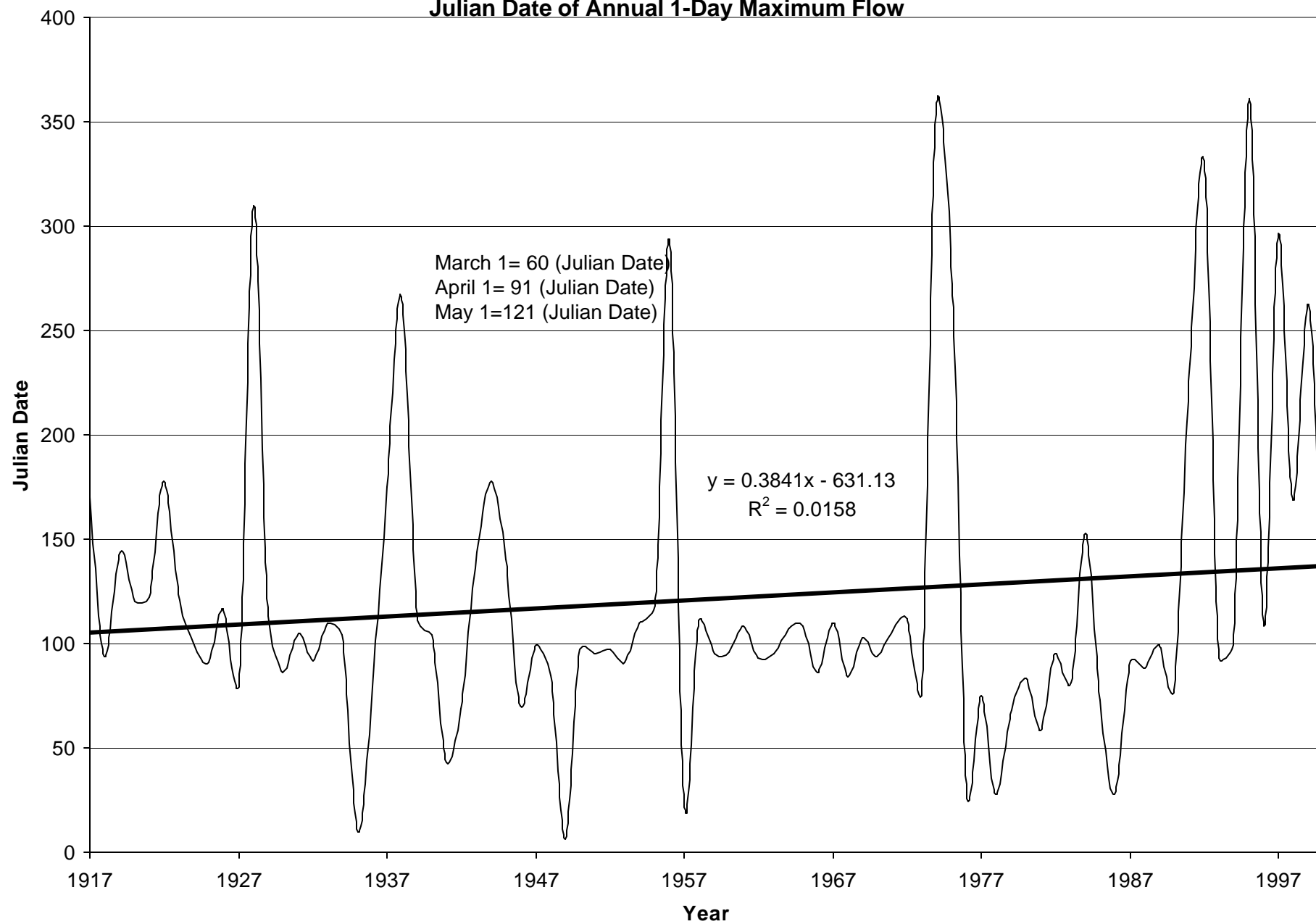


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Julian Date of Annual 1-Day Minimum Flow**



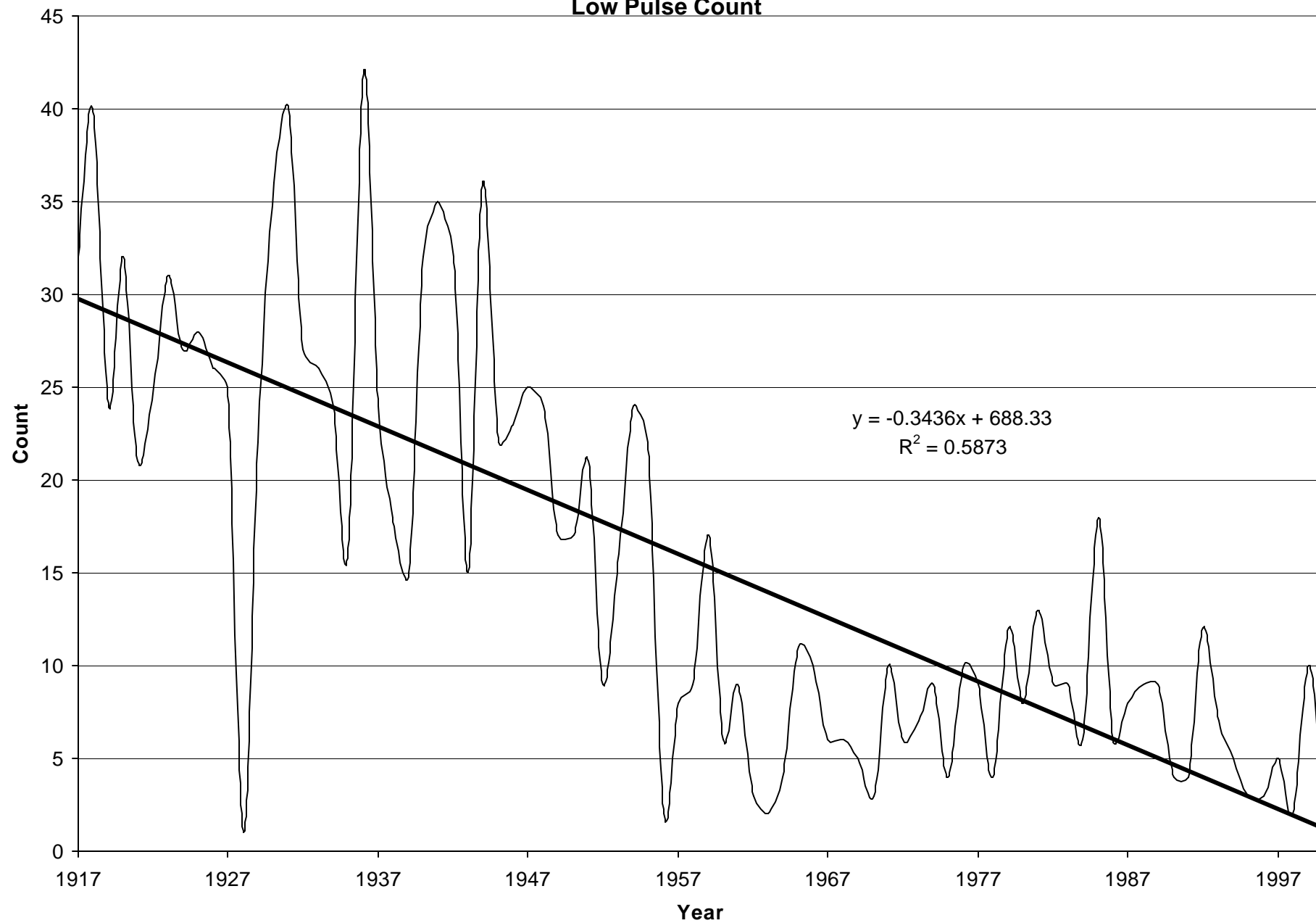


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Julian Date of Annual 1-Day Maximum Flow**



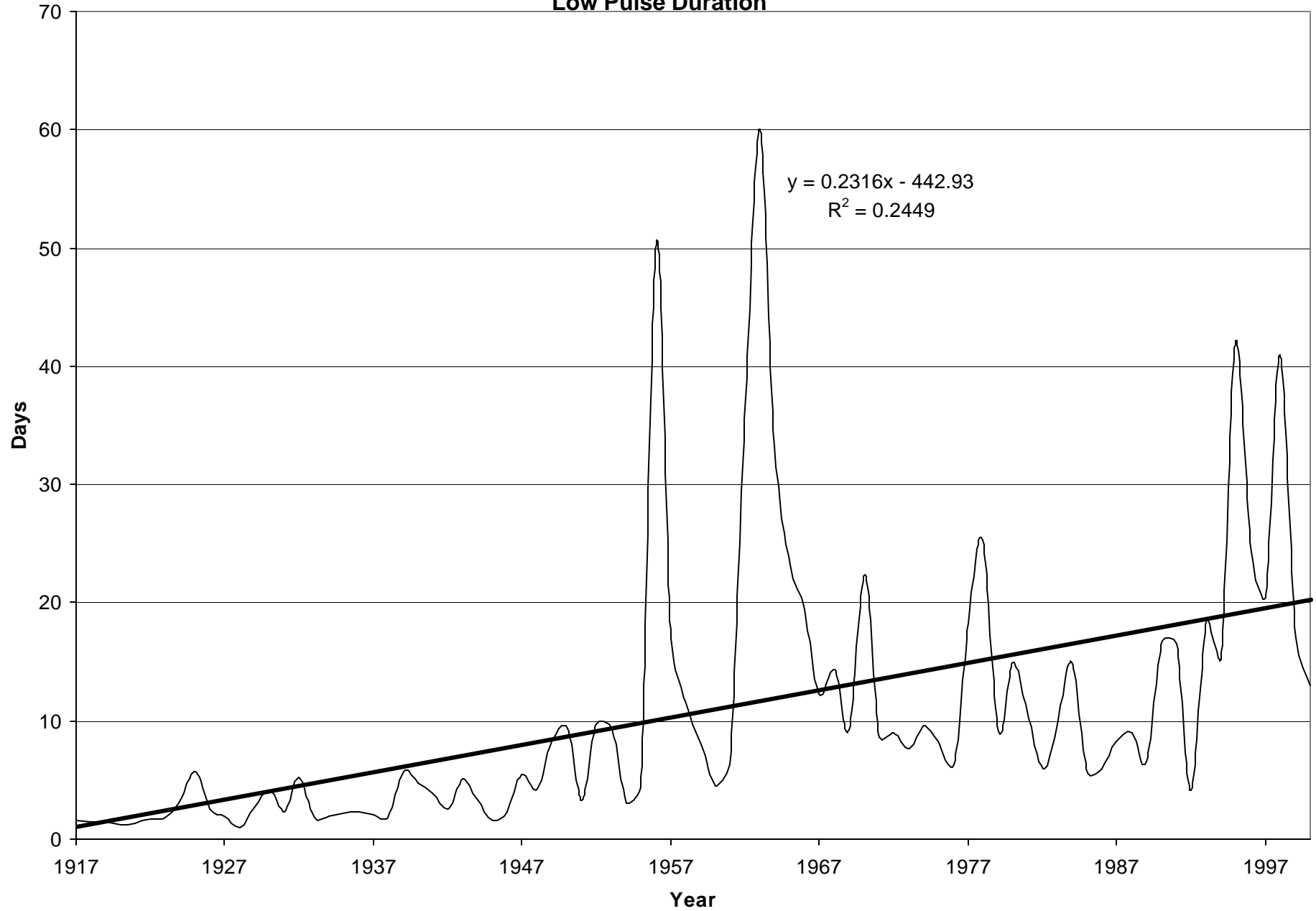
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**

**Low Pulse Count**



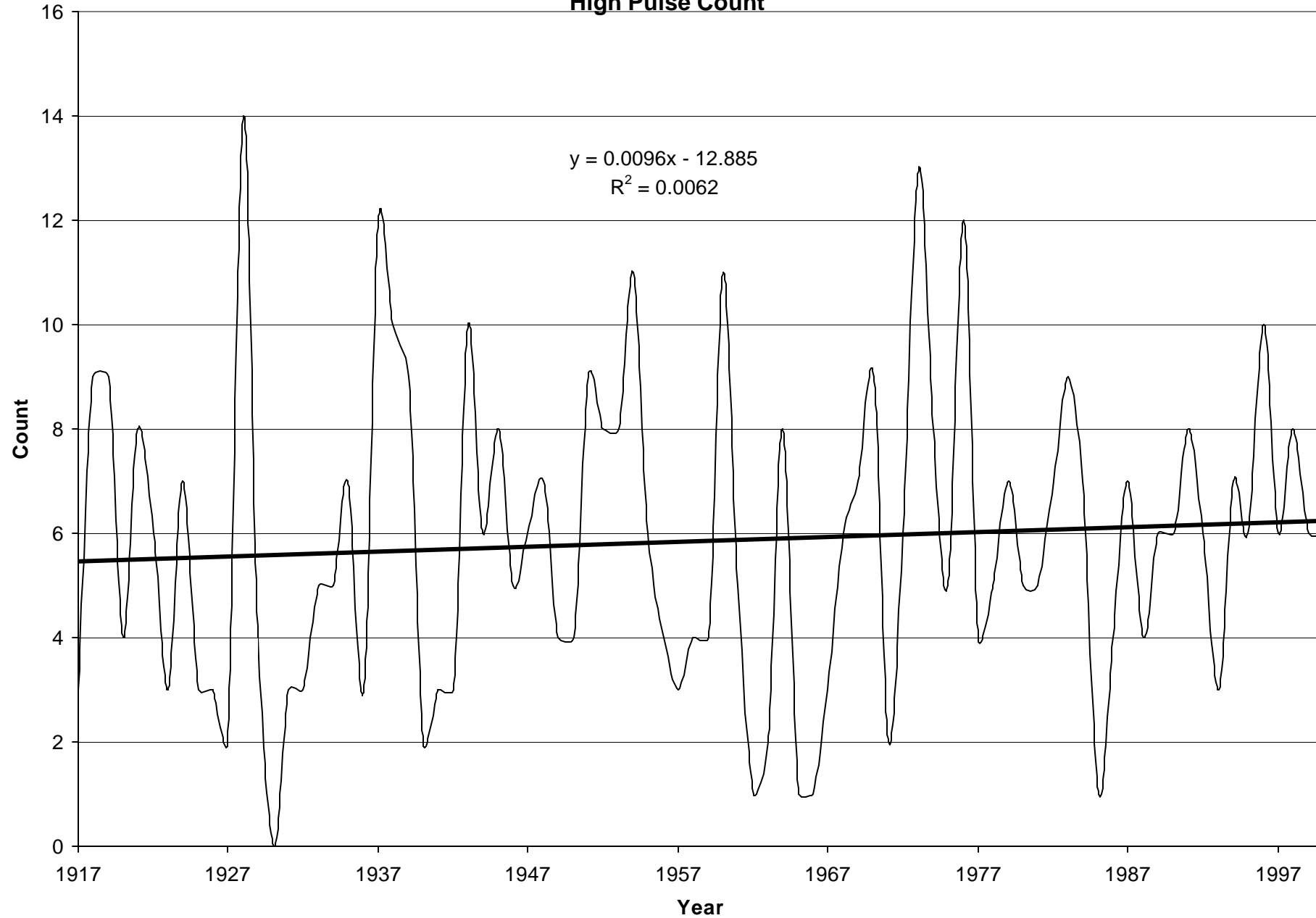
**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**

**Low Pulse Duration**

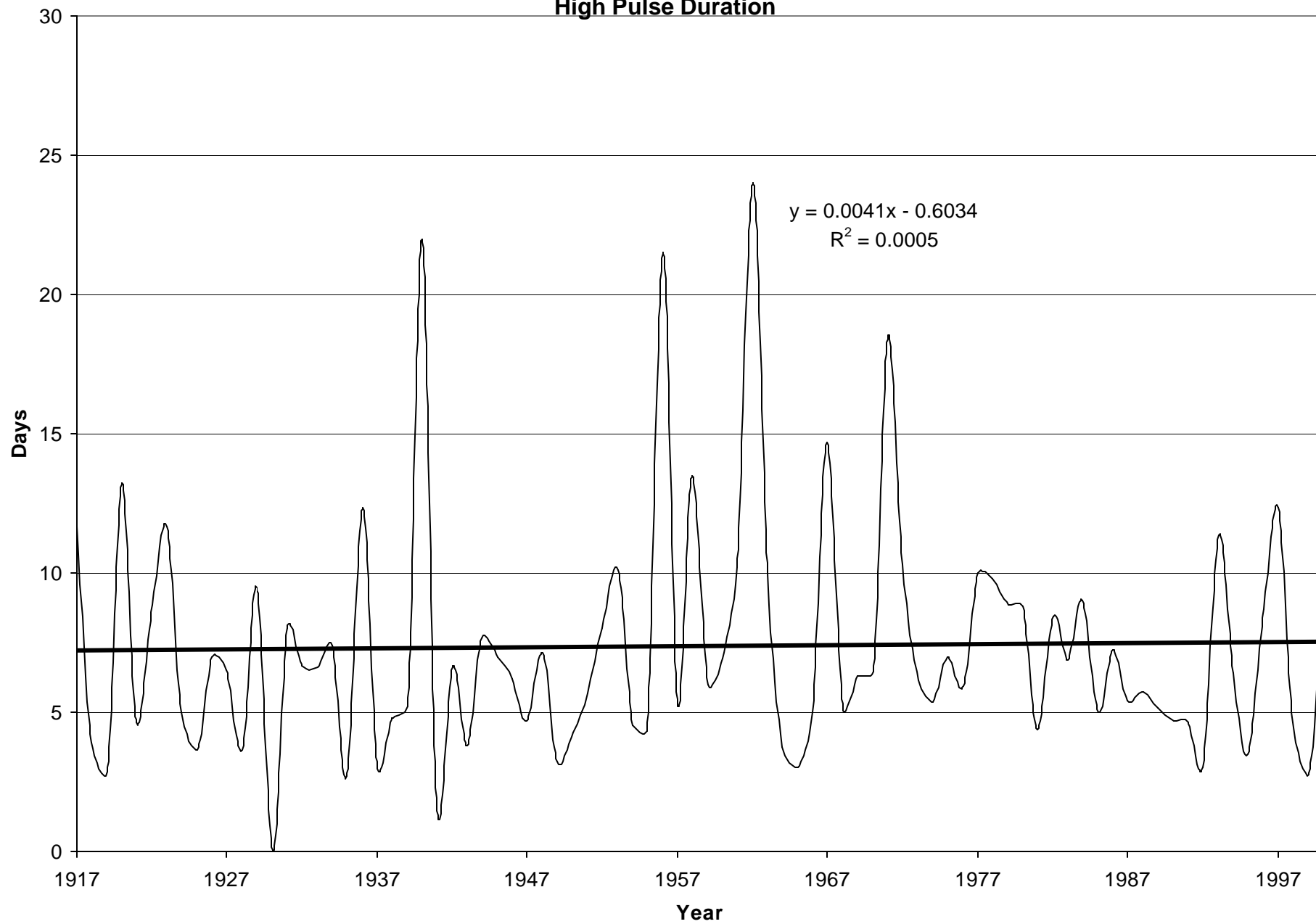


Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi

High Pulse Count

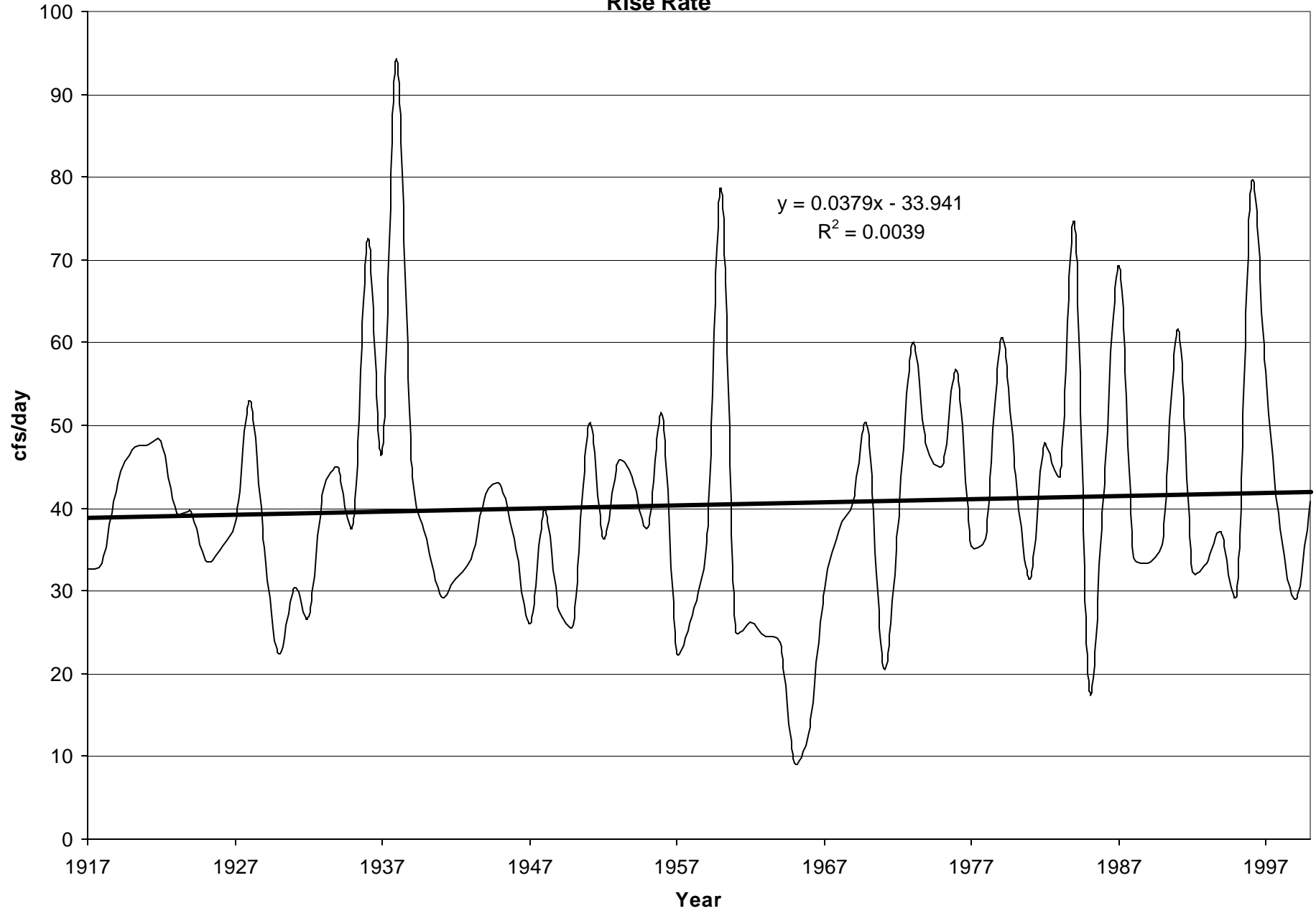


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**High Pulse Duration**

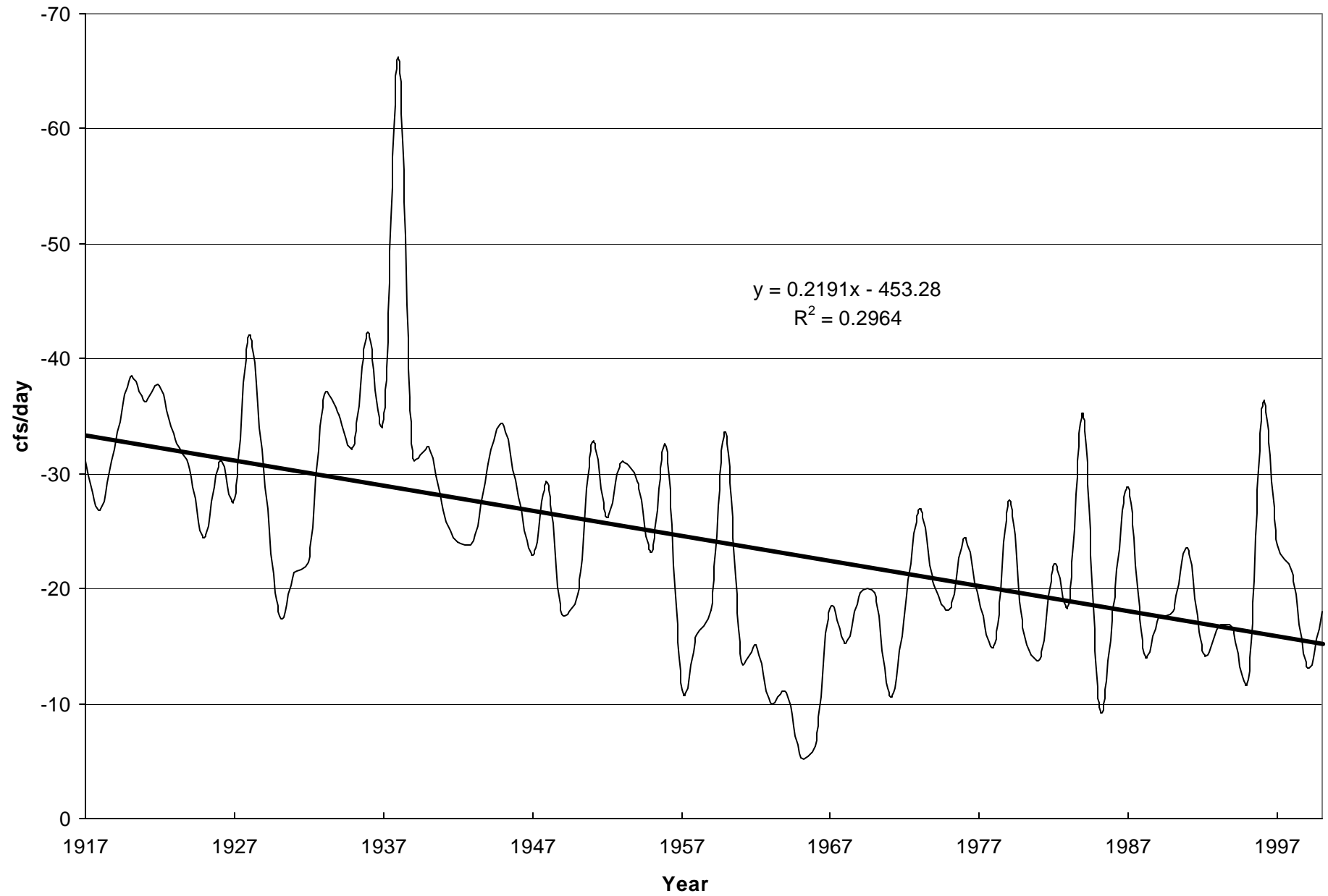


**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**

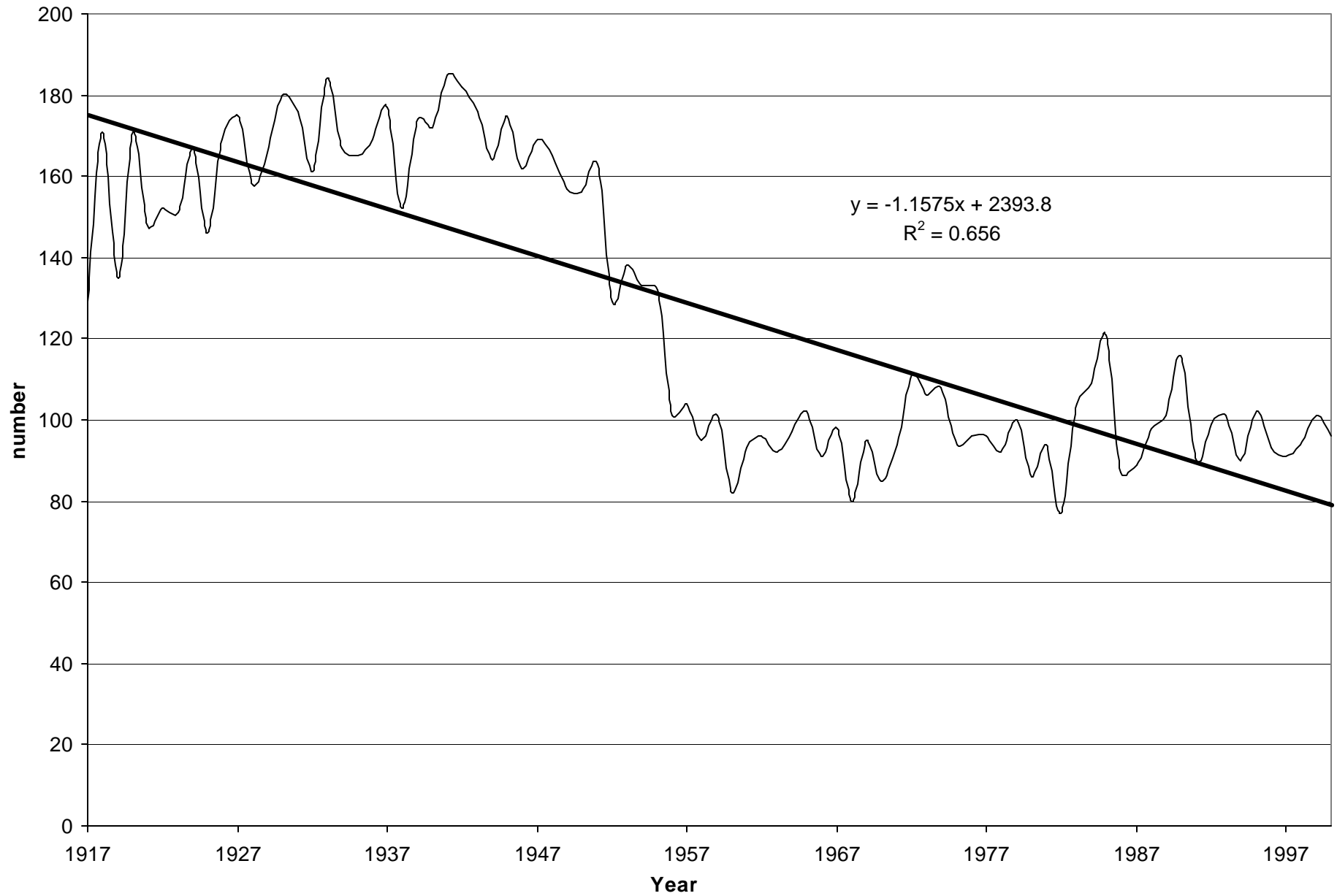
**Rise Rate**



**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Fall Rate**



**Millers River near Winchendon, MA, Drainage Area= 81.8 sq mi**  
**Reversals**



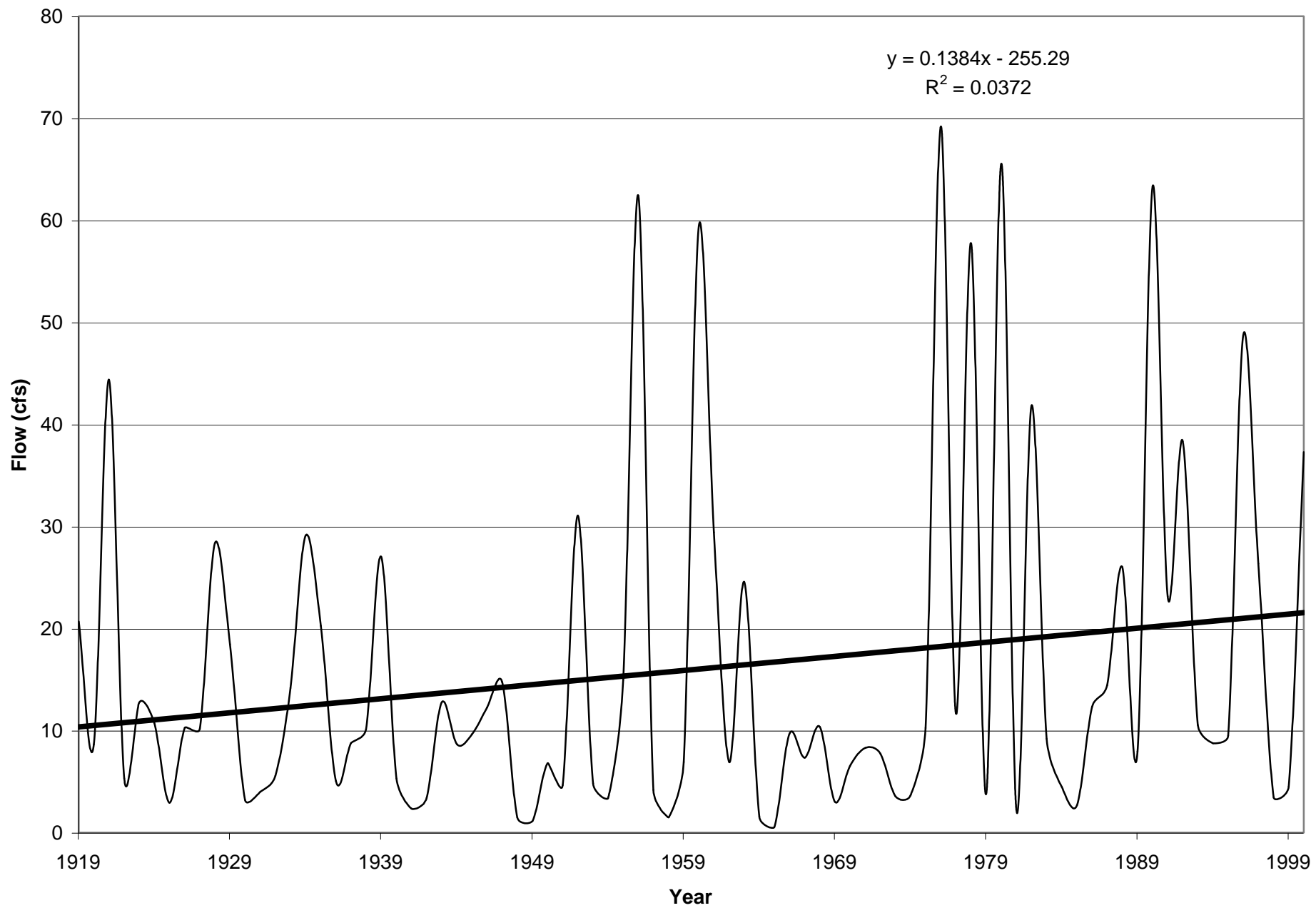


**Priest Brook near Winchendon, MA**  
**Drainage Area= 19.4 square miles**  
**Period of Record: Water Years 1919-2000**  
***IHA Results***

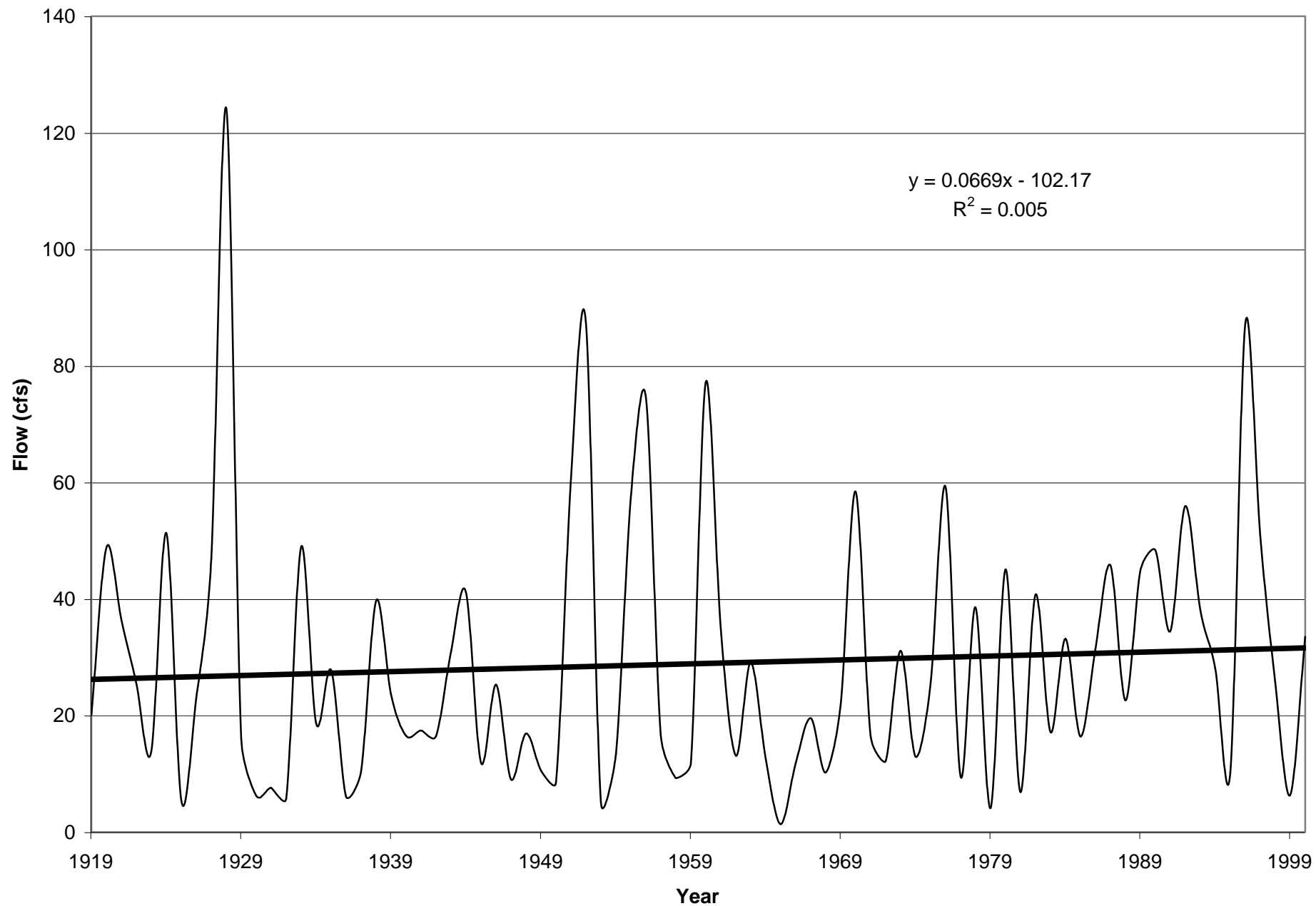
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1. Average Monthly Flow for October
2. Average Monthly Flow for November
3. Average Monthly Flow for December
4. Average Monthly Flow for January
5. Average Monthly Flow for February
6. Average Monthly Flow for March
7. Average Monthly Flow for April
8. Average Monthly Flow for May
9. Average Monthly Flow for June
10. Average Monthly Flow for July
11. Average Monthly Flow for August
12. Average Monthly Flow for September
13. 1-Day Minimum Flow
14. 3-Day Minimum Flow
15. 7-Day Minimum Flow
16. 30-Day Minimum Flow
17. 90-Day Minimum Flow
18. 1-Day Maximum Flow
19. 3-Day Maximum Flow
20. 7-Day Maximum Flow
21. 30-Day Maximum Flow
22. 90-Day Maximum Flow
23. Zero Days
24. Base Flow
25. Julian Date of Annual 1-Day Minimum Flow
26. Julian Date of Annual 1-Day Maximum Flow
27. Low Pulse Count
28. Low Pulse Duration
29. High Pulse Count
30. High Pulse Duration
31. Rise Rate
32. Fall Rate
33. Reversals

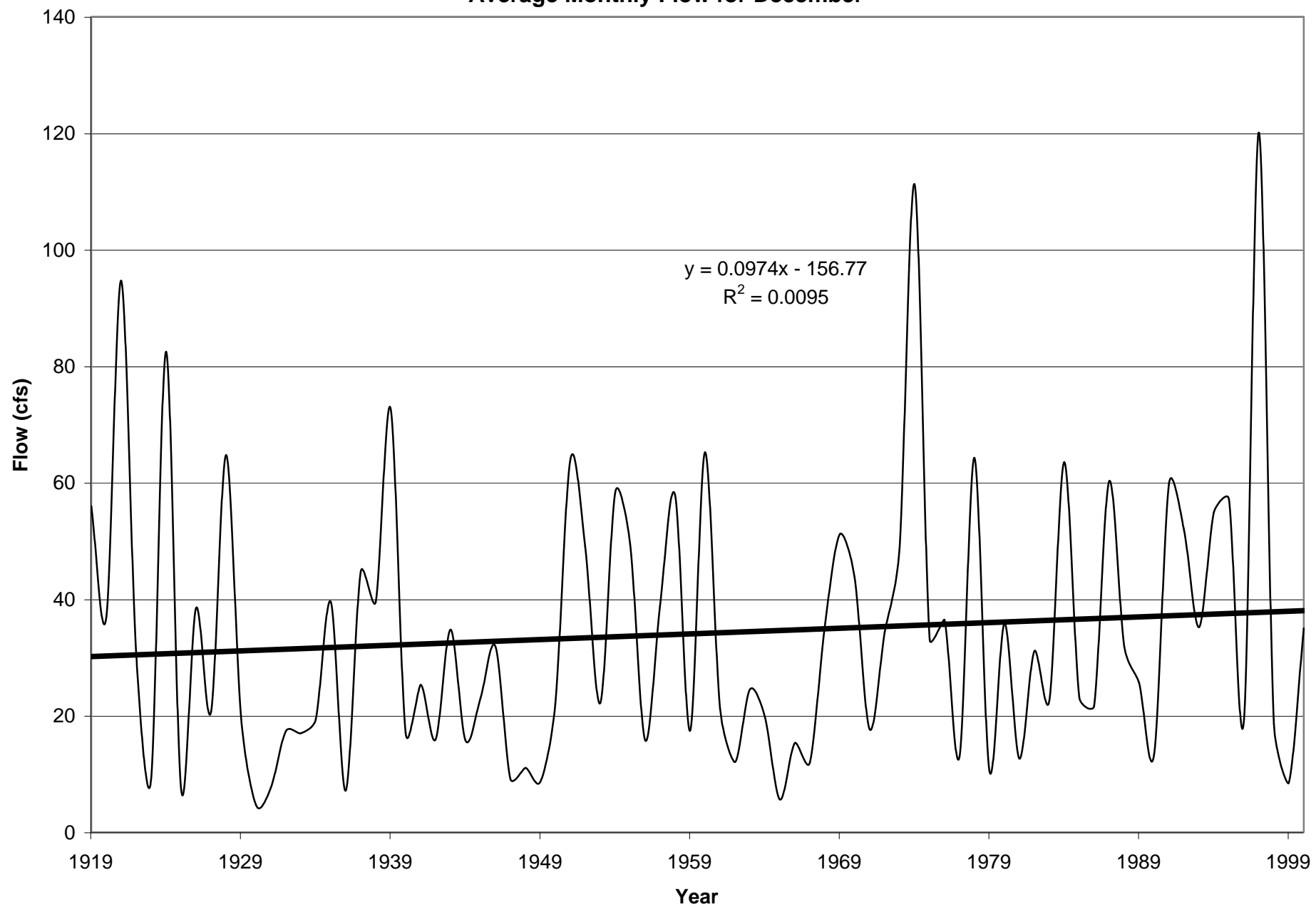
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for October**



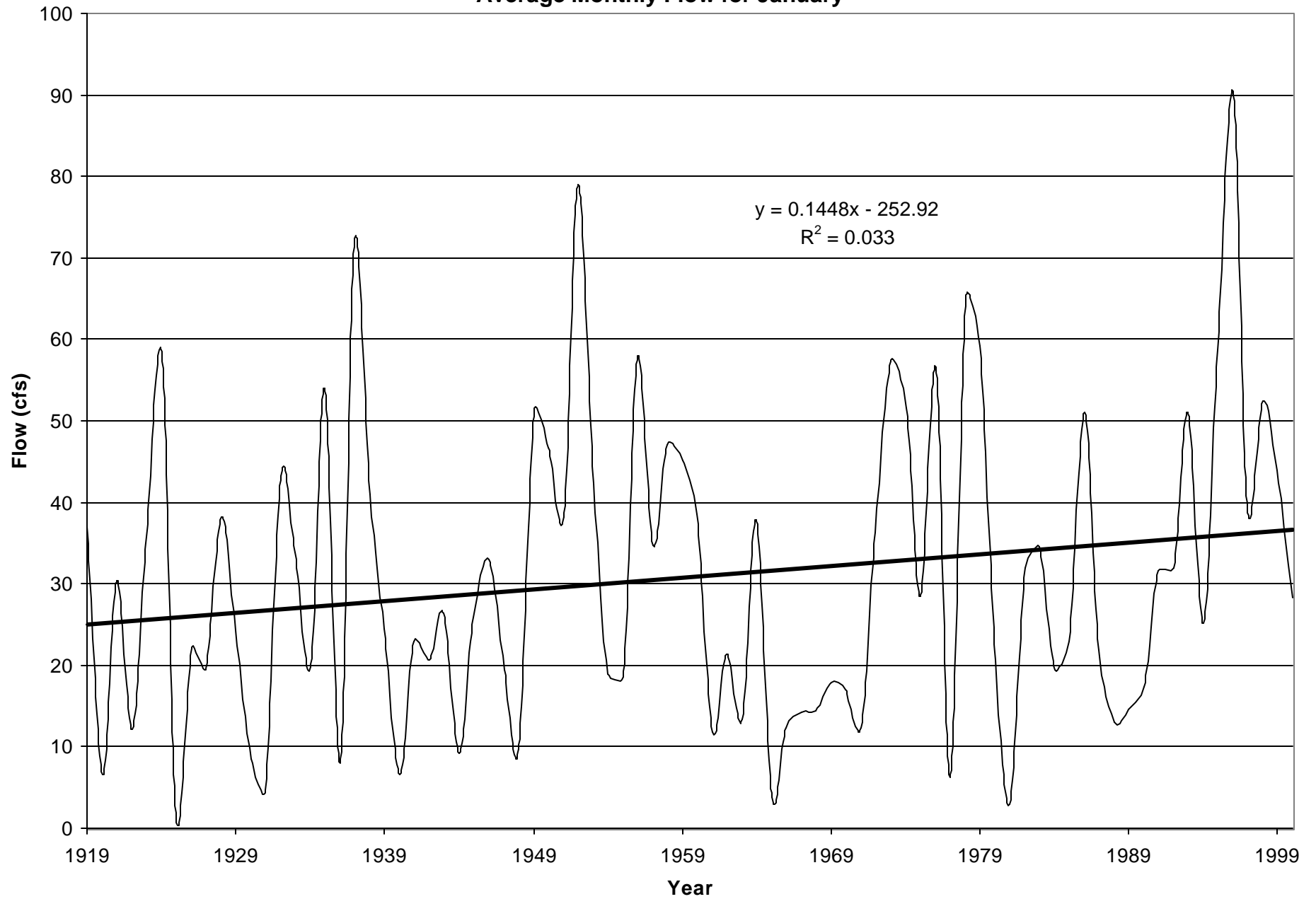
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for November**



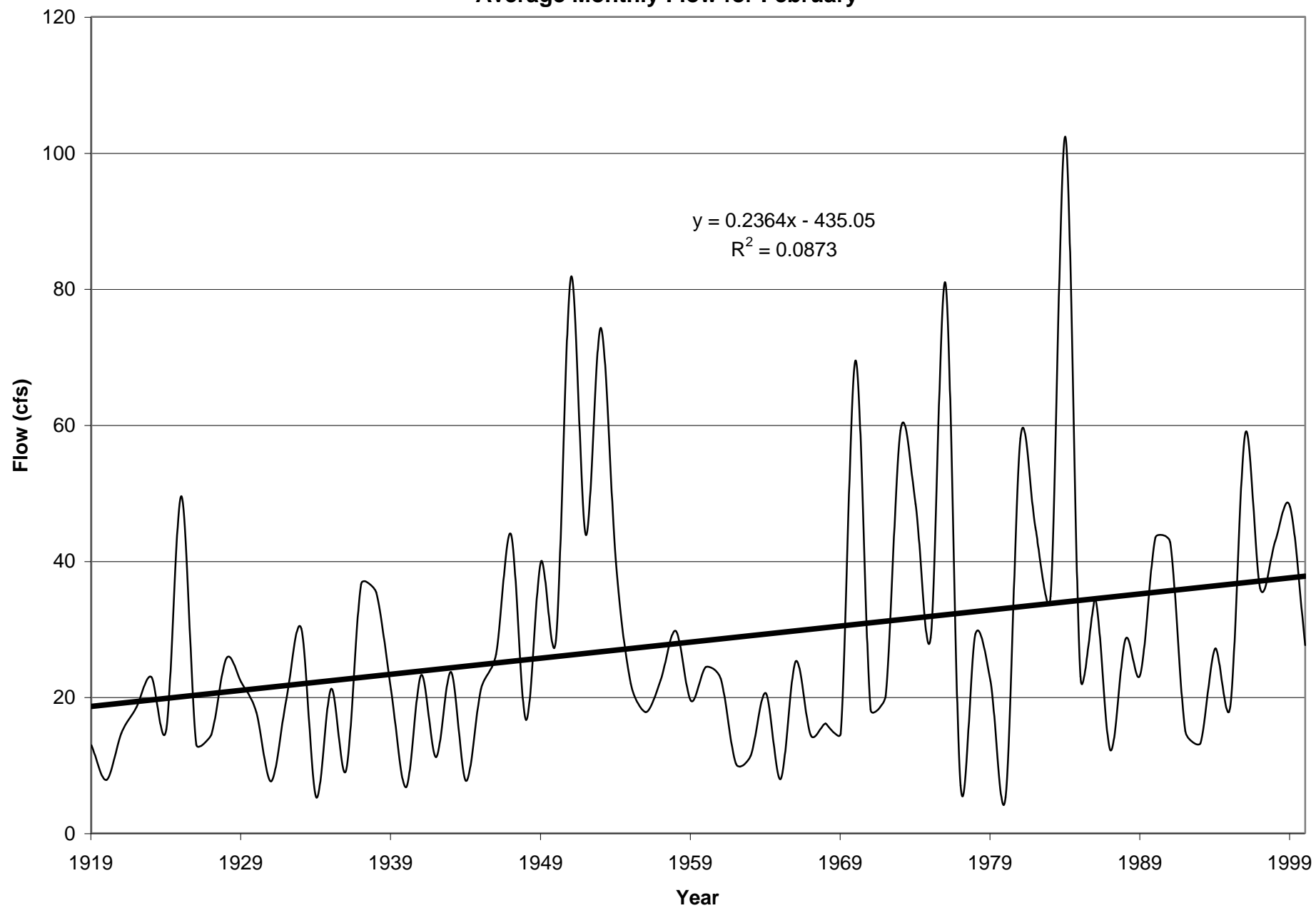
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for December**



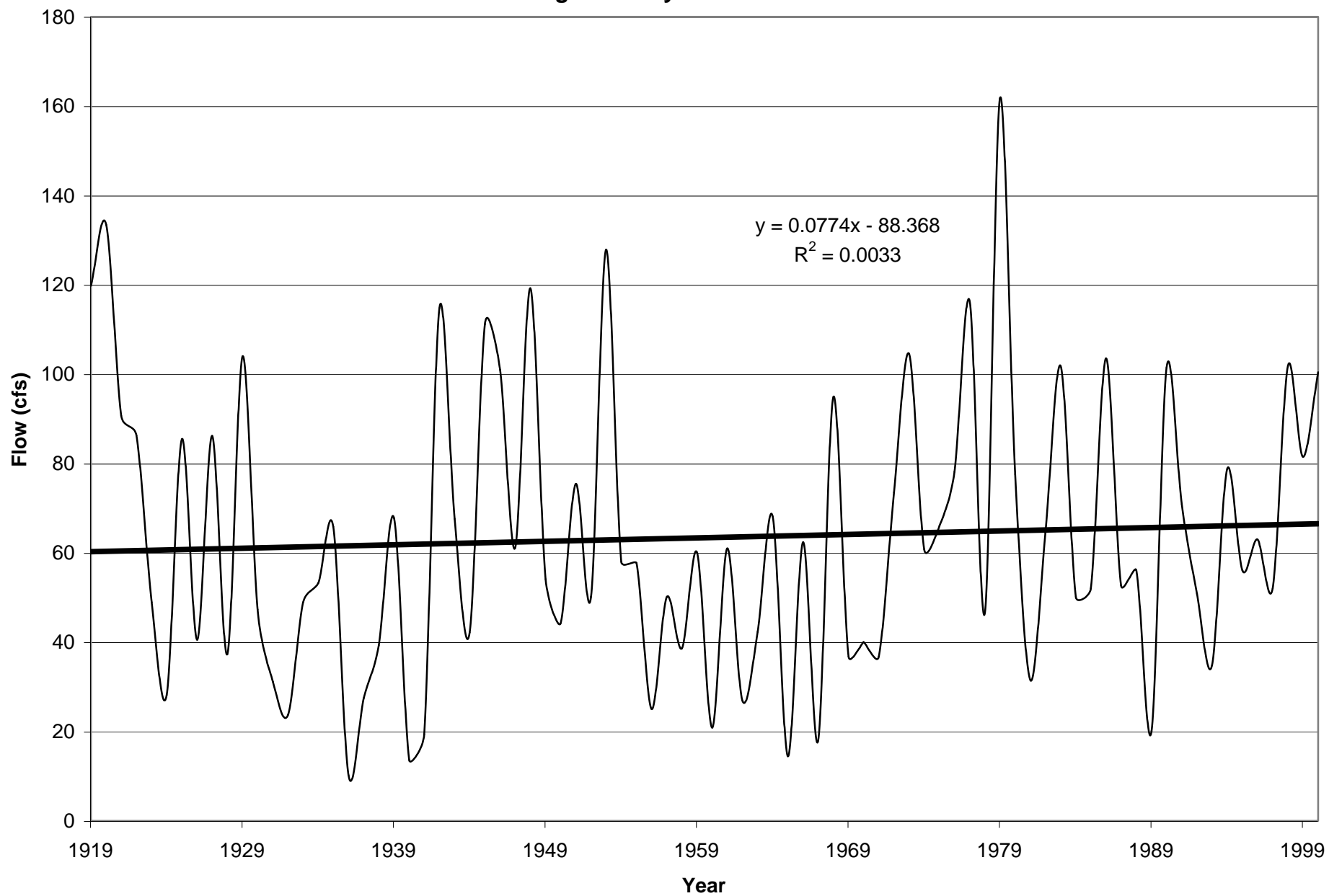
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for January**



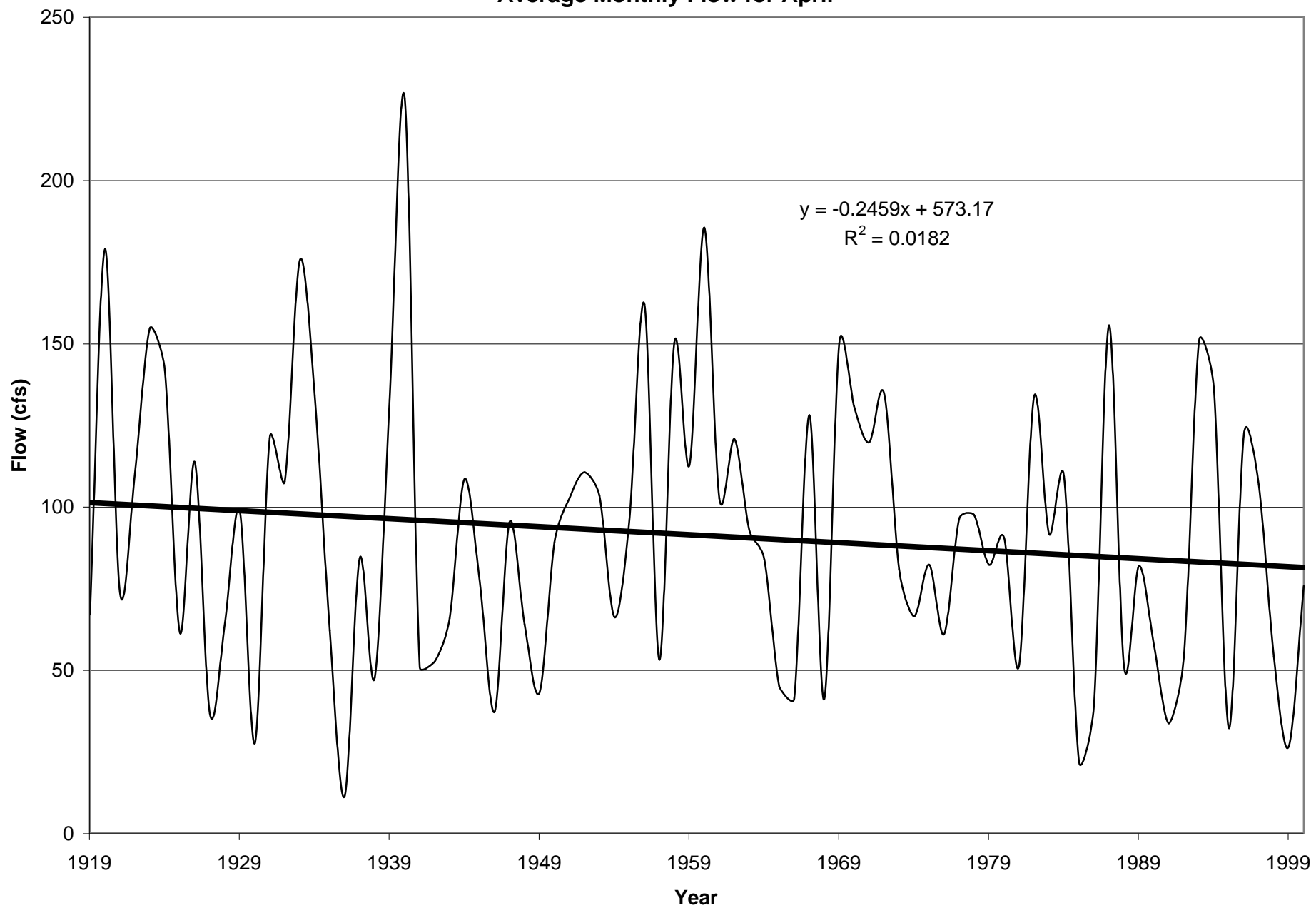
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for February**



**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for March**

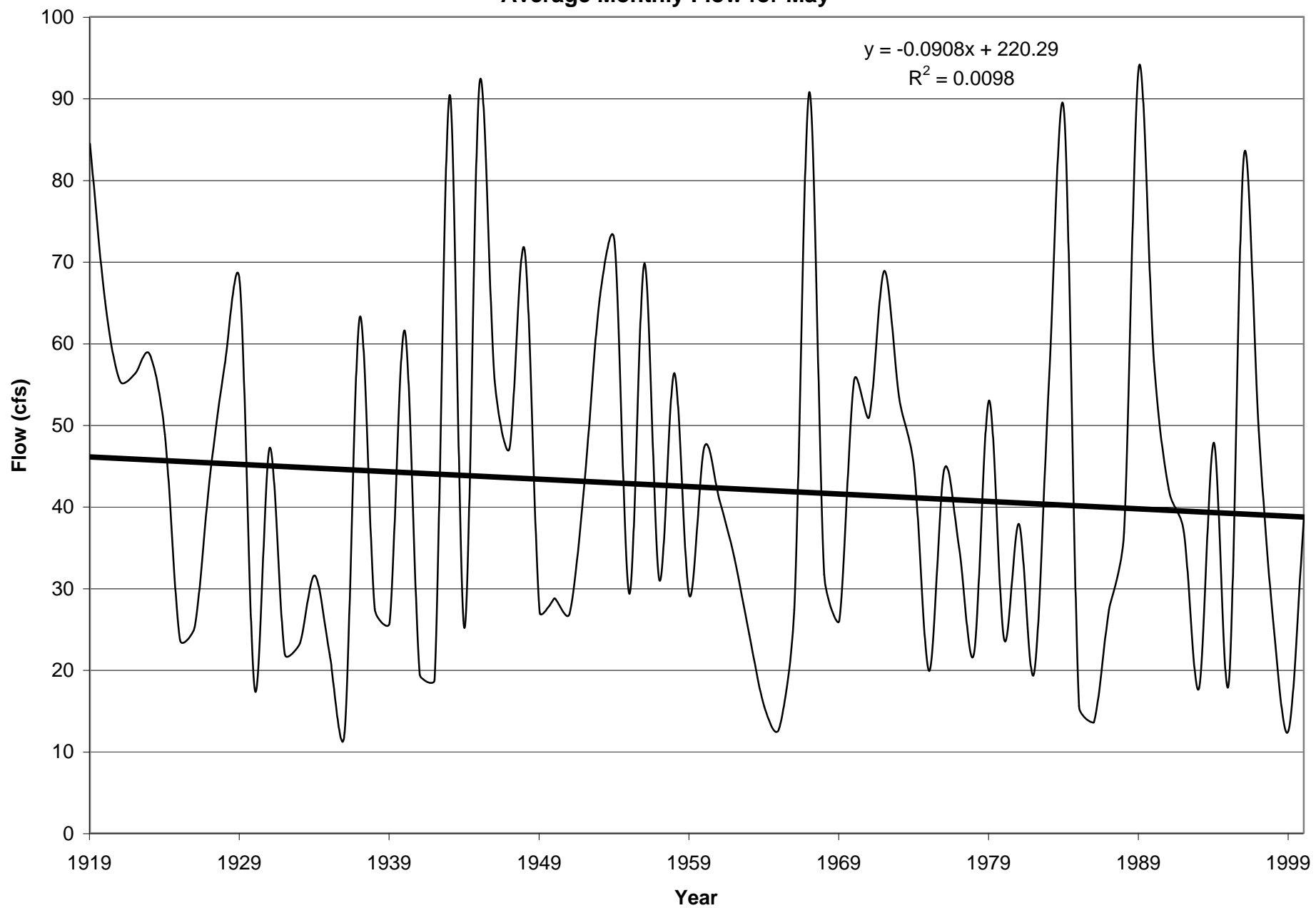


**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for April**

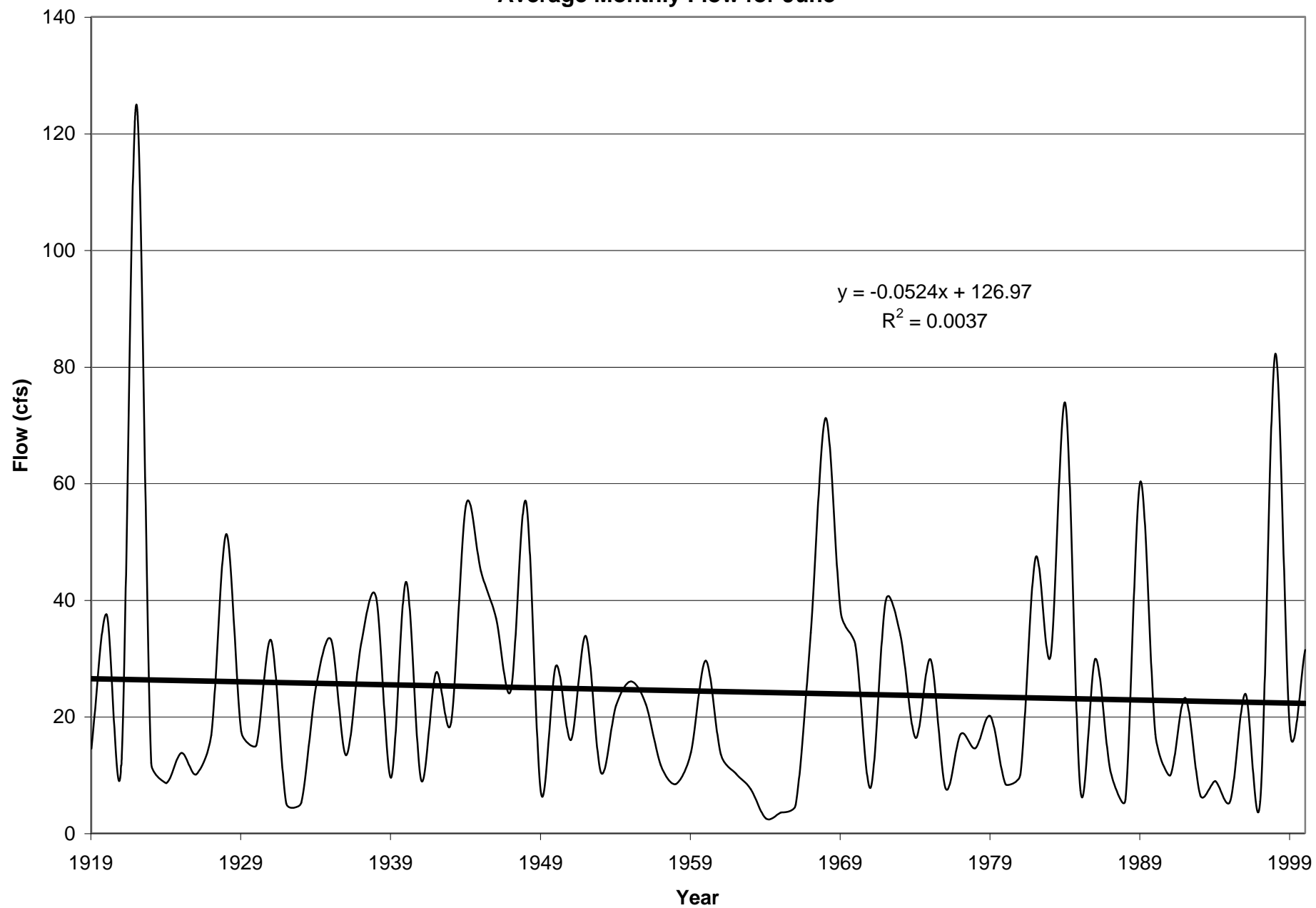




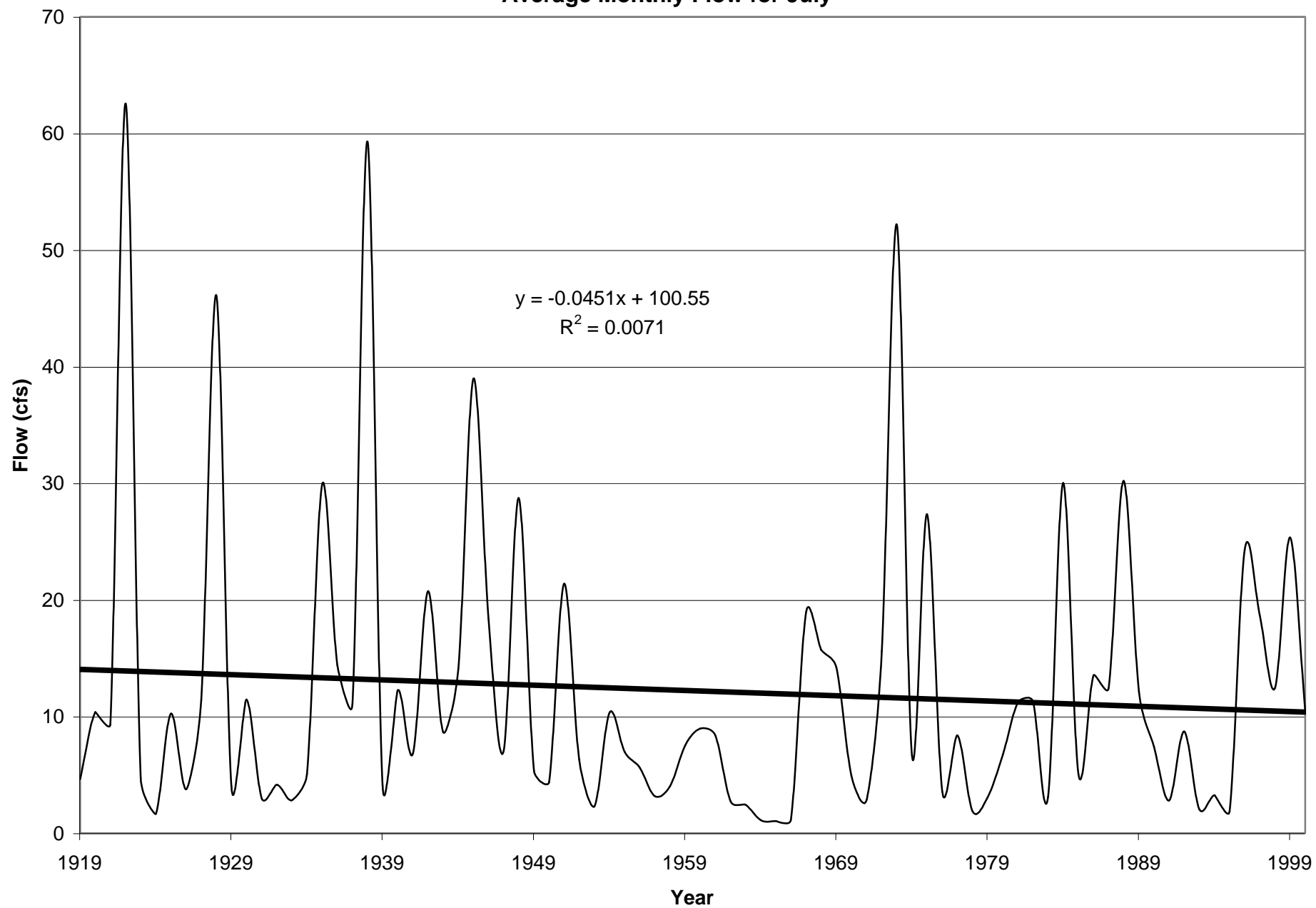
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for May**



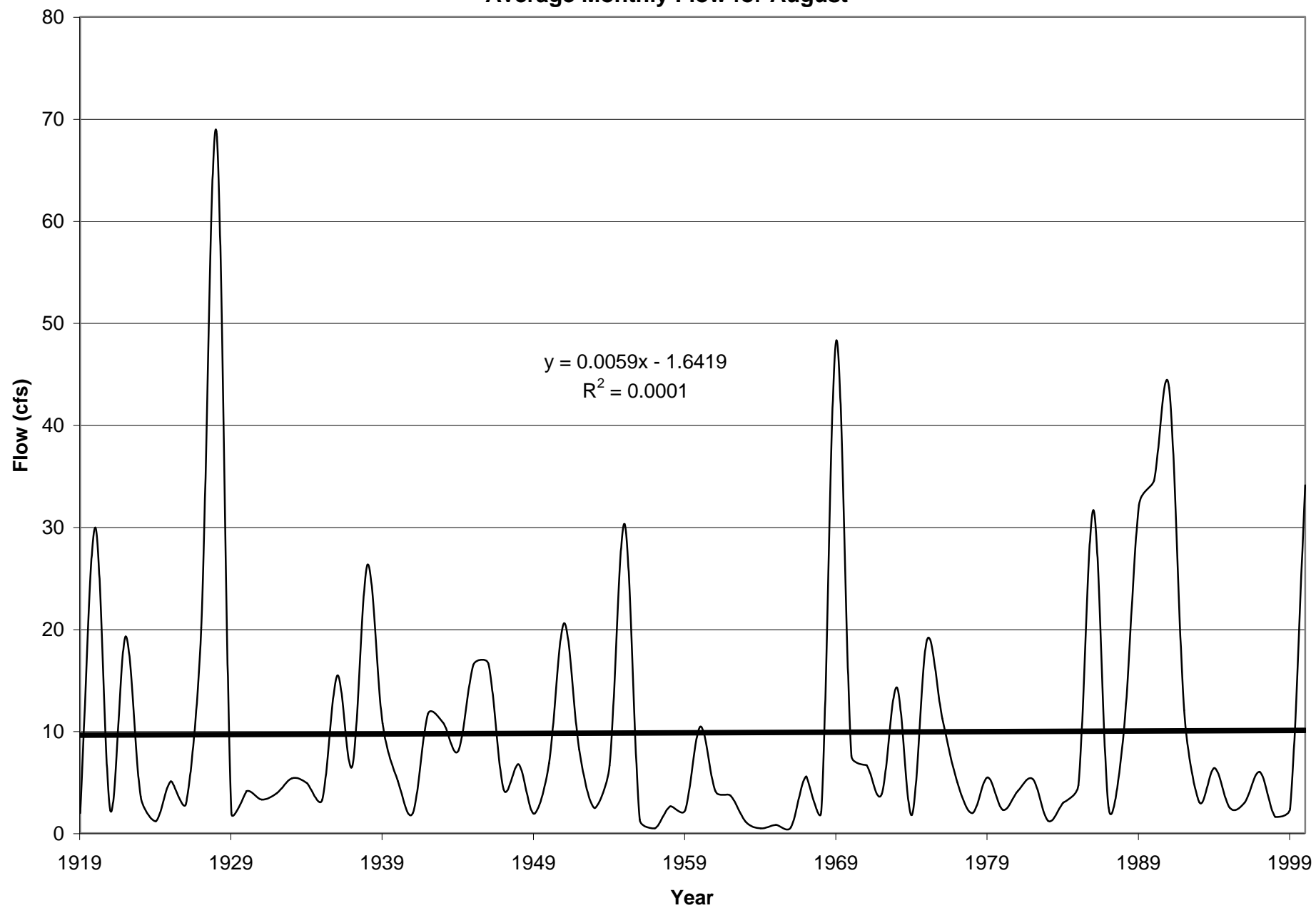
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for June**



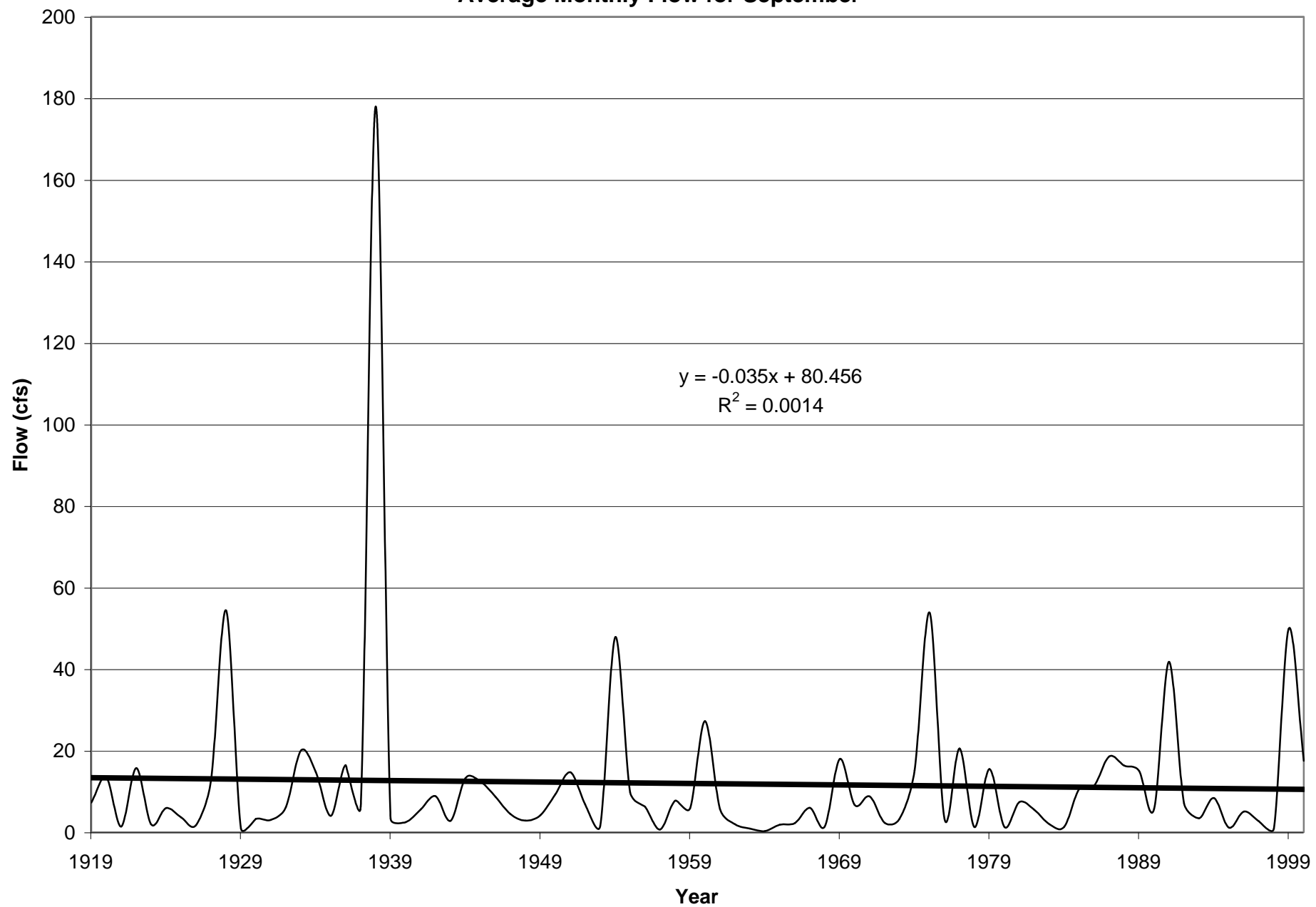
Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi  
Average Monthly Flow for July



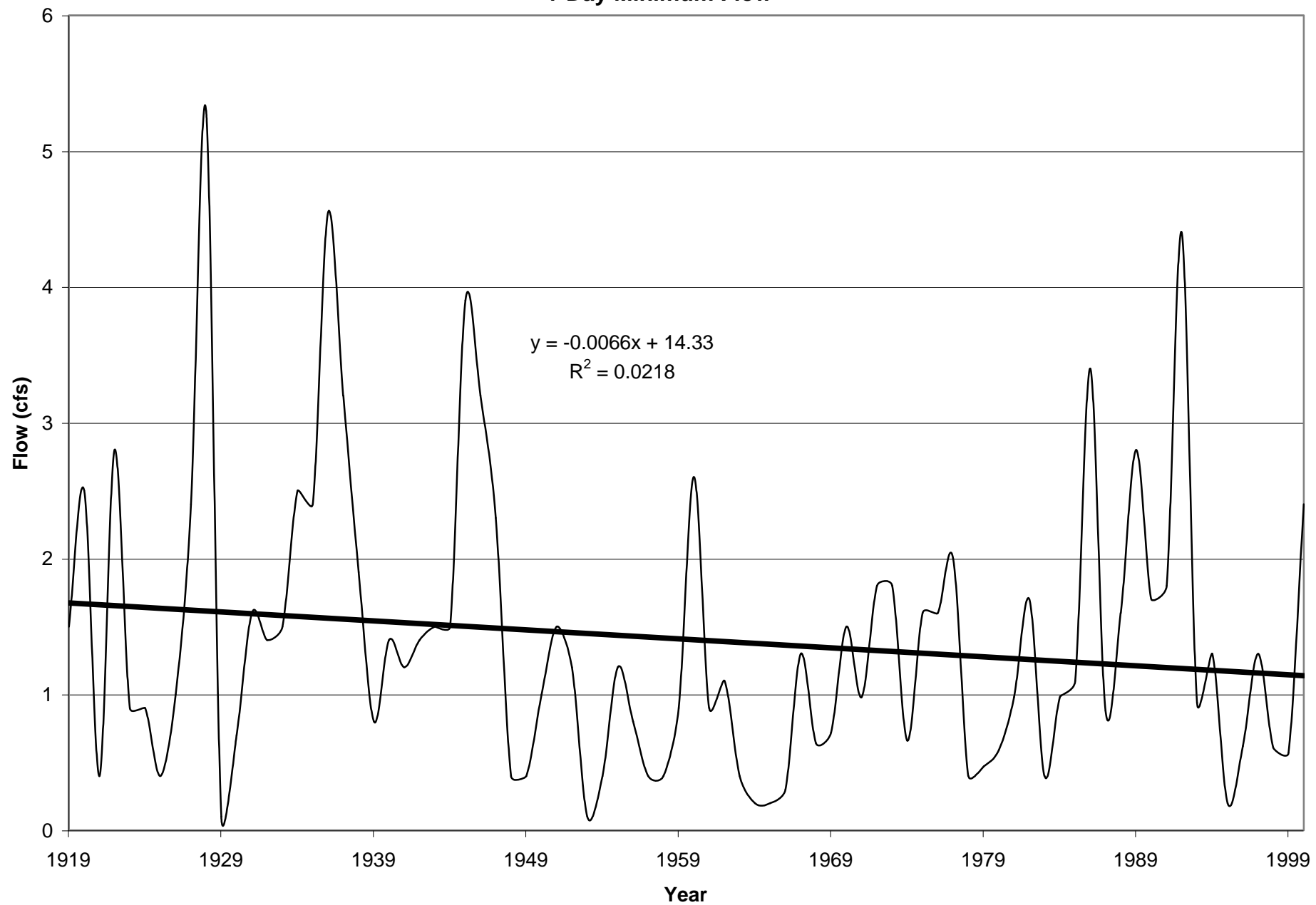
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for August**



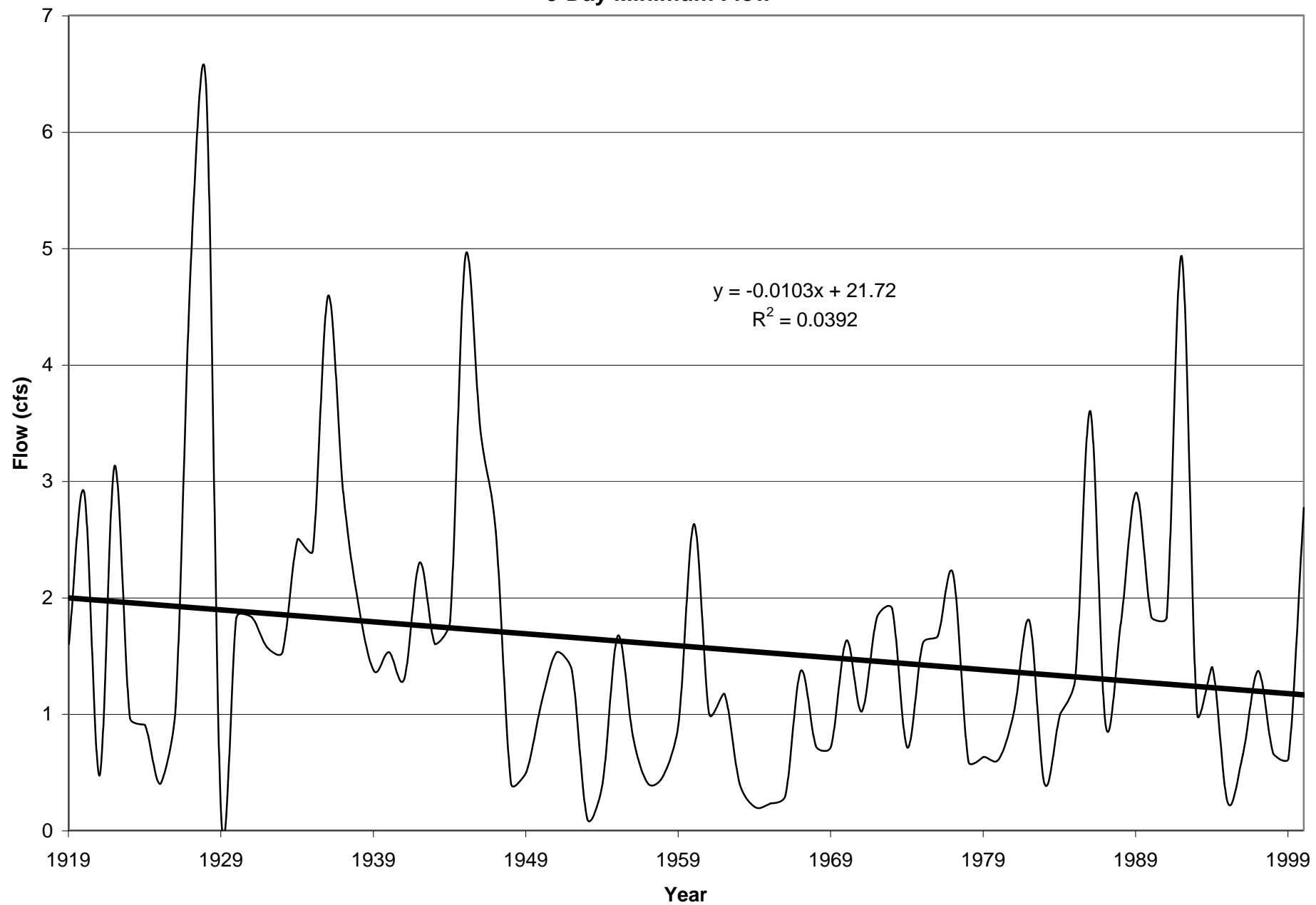
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Average Monthly Flow for September**



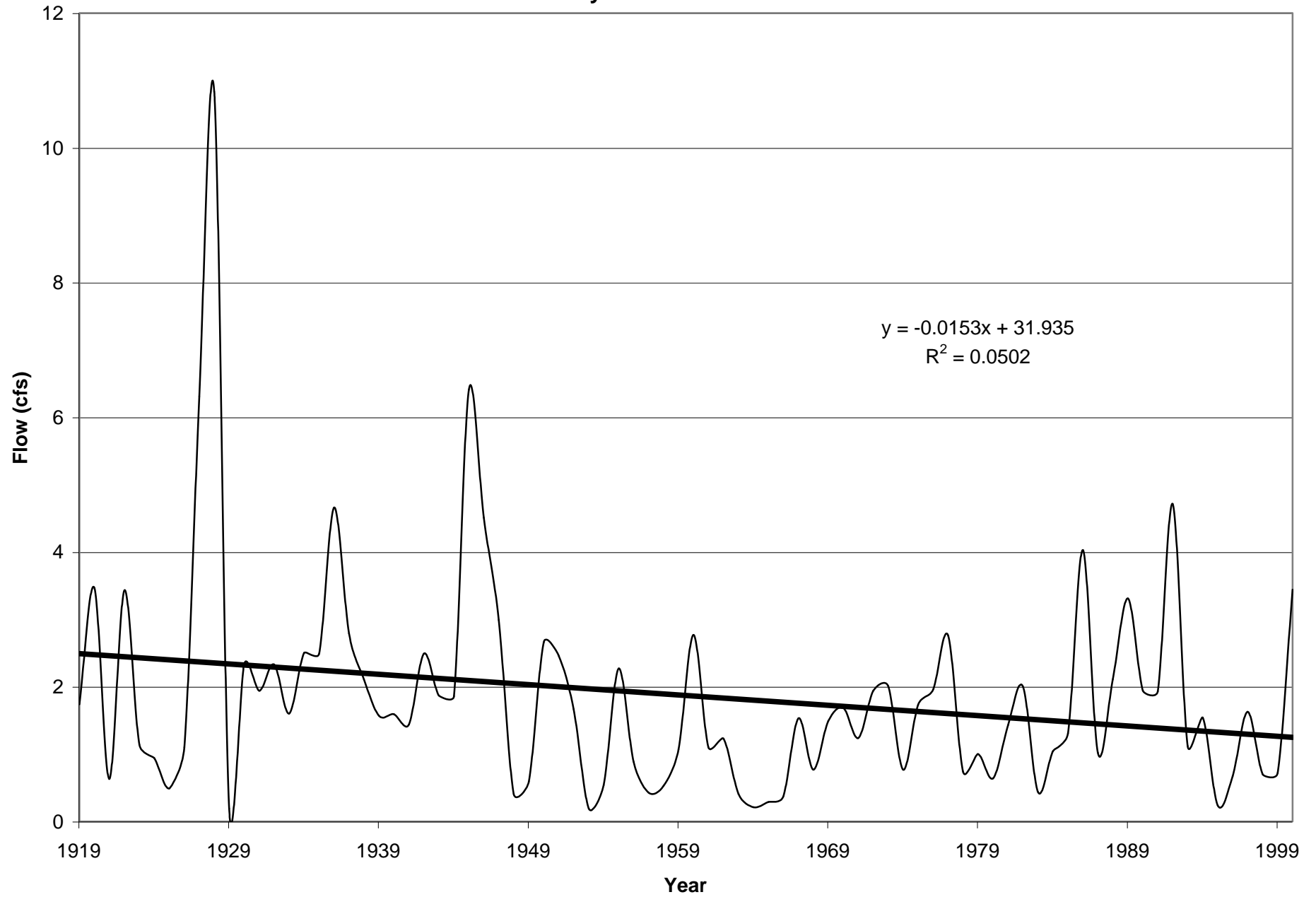
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**1-Day Minimum Flow**



**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**3-Day Minimum Flow**

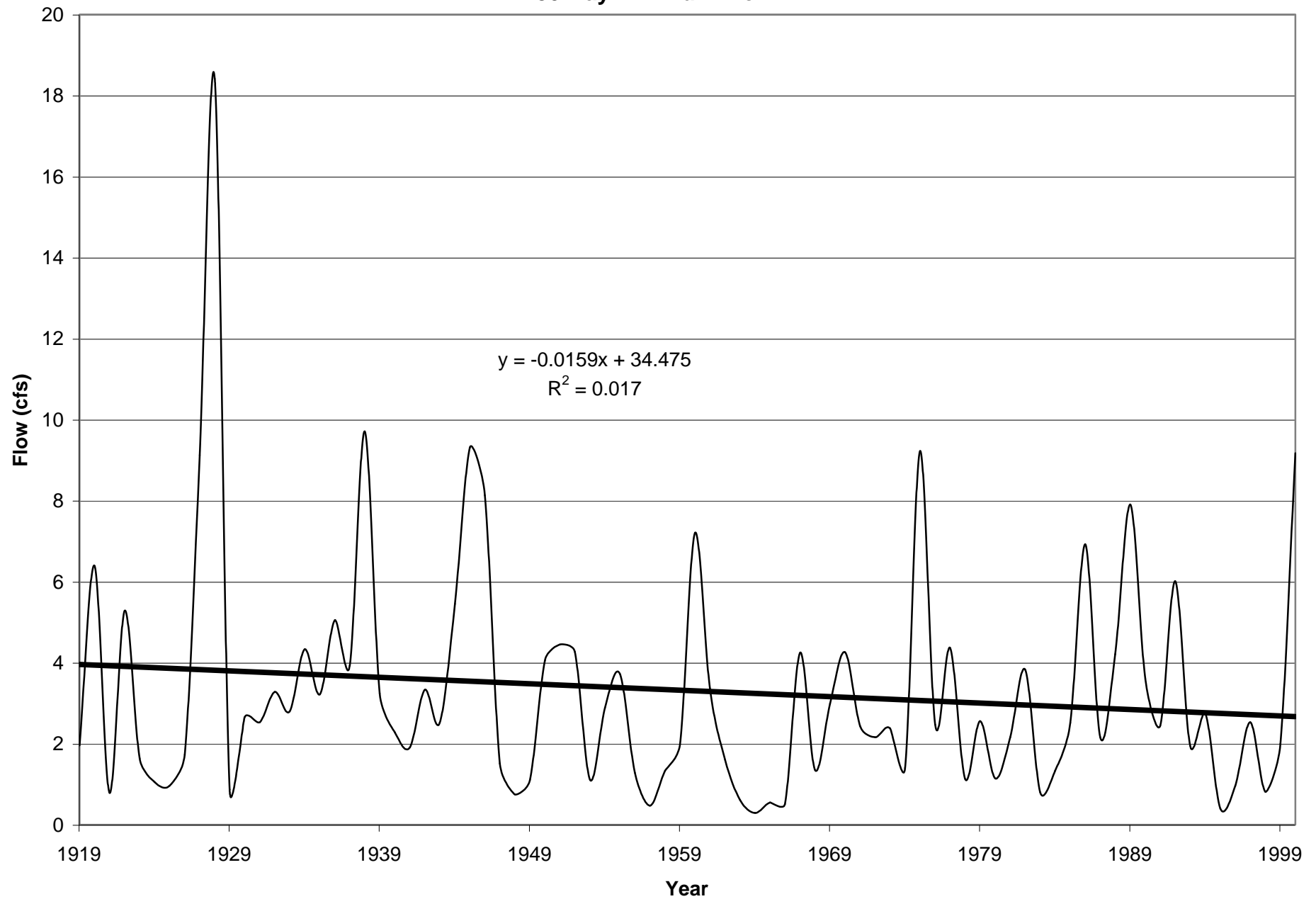


**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**7-Day Minimum Flow**

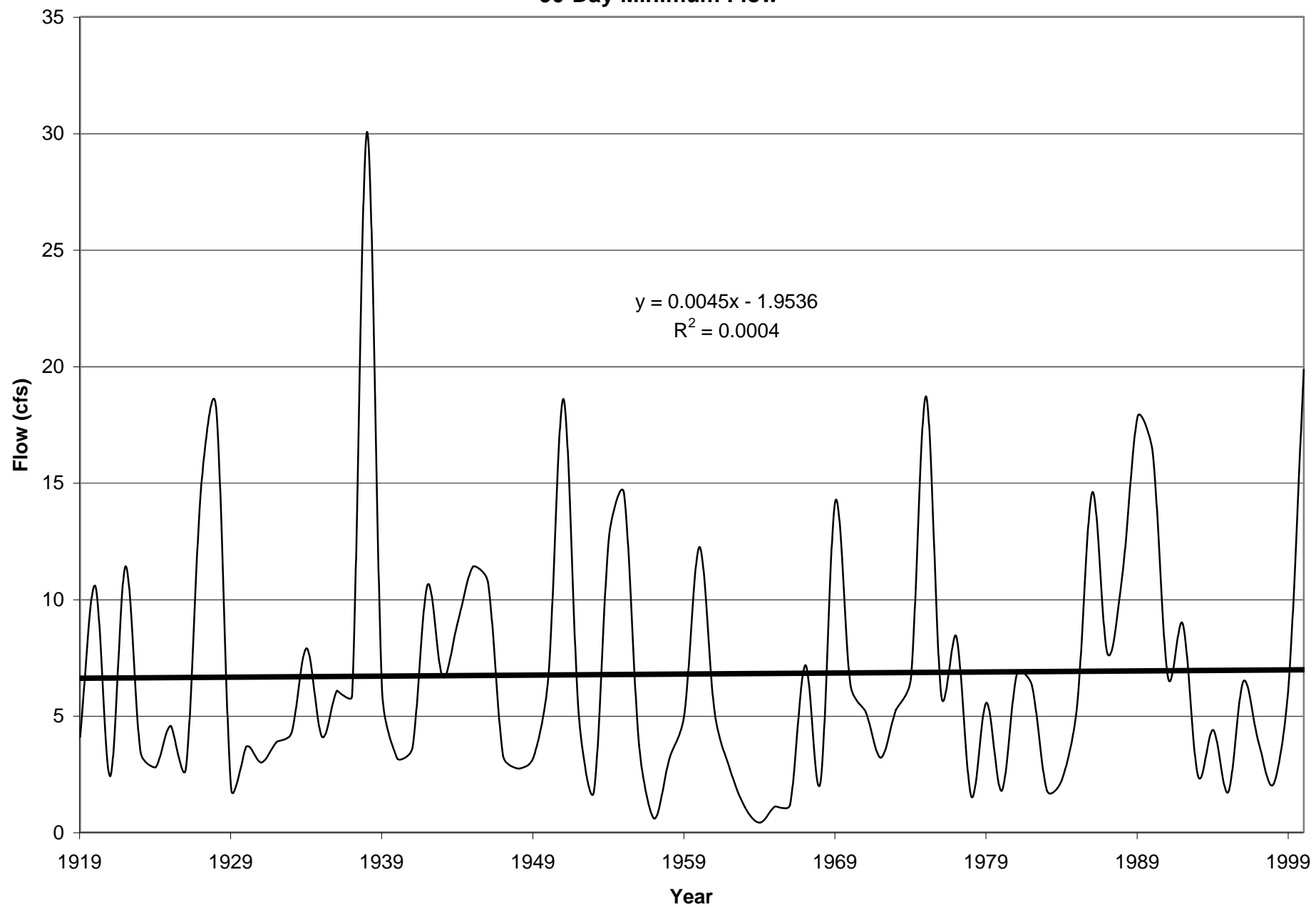




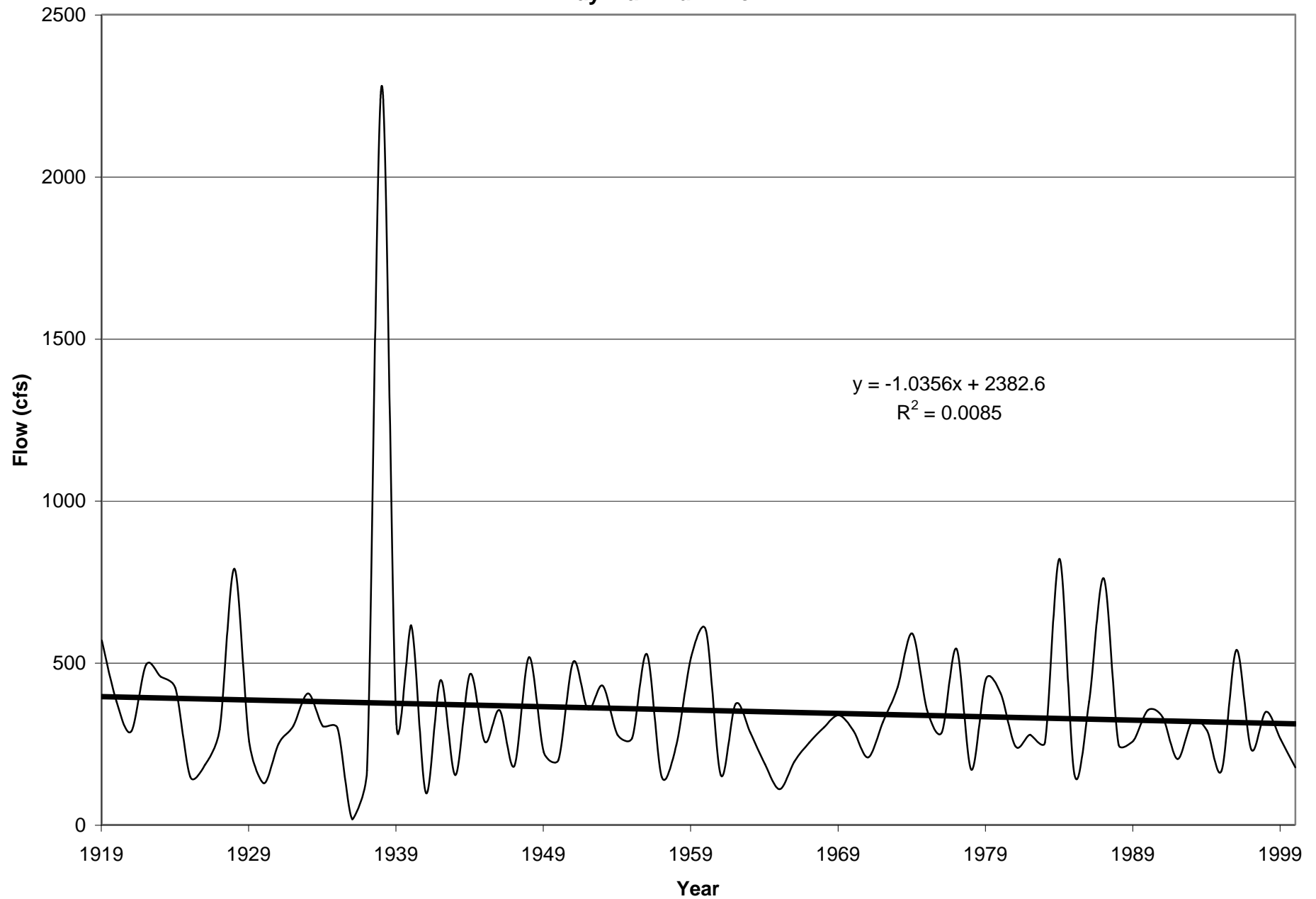
Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi  
30-Day Minimum Flow



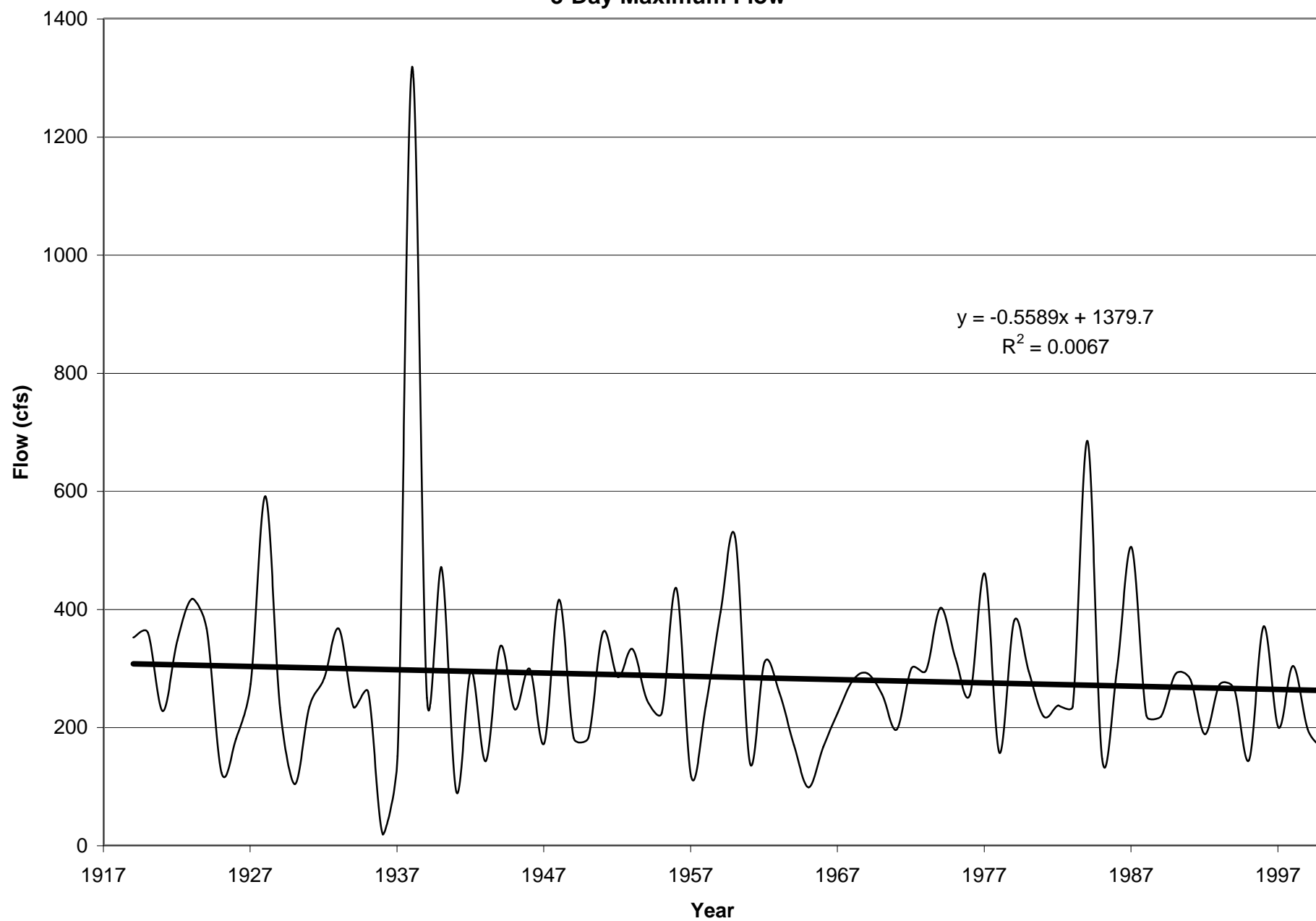
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**90-Day Minimum Flow**



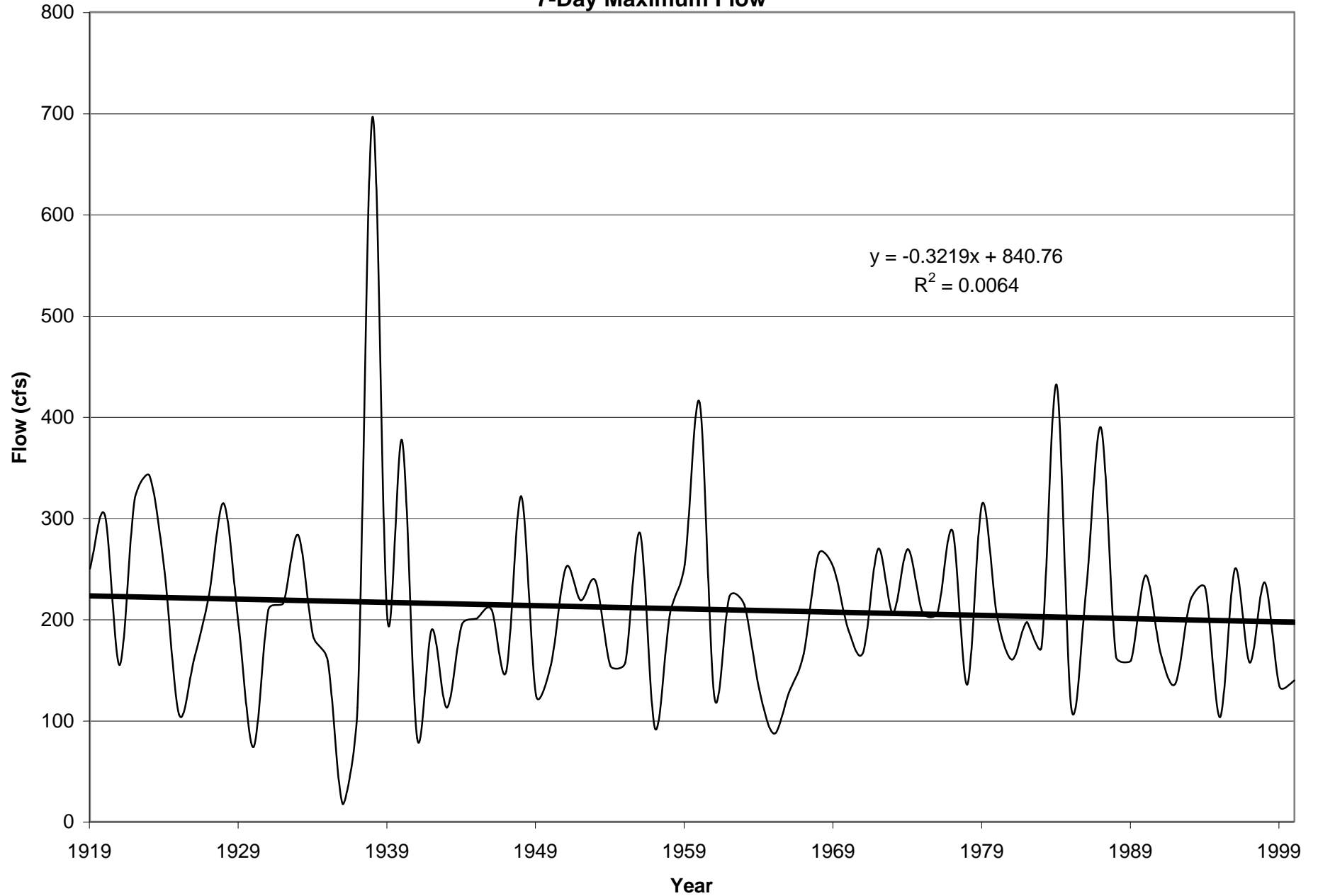
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**1-Day Maximum Flow**



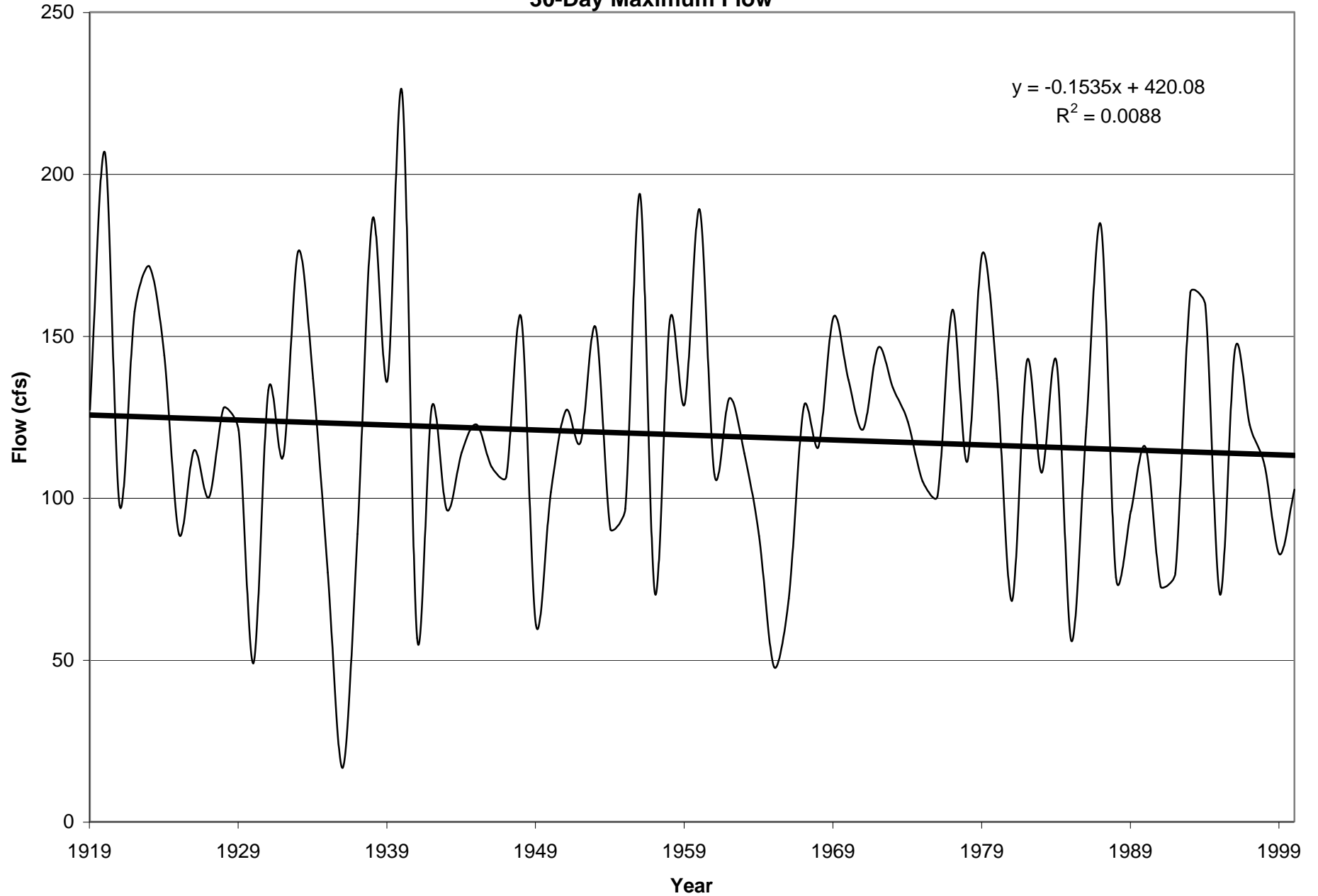
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**3-Day Maximum Flow**



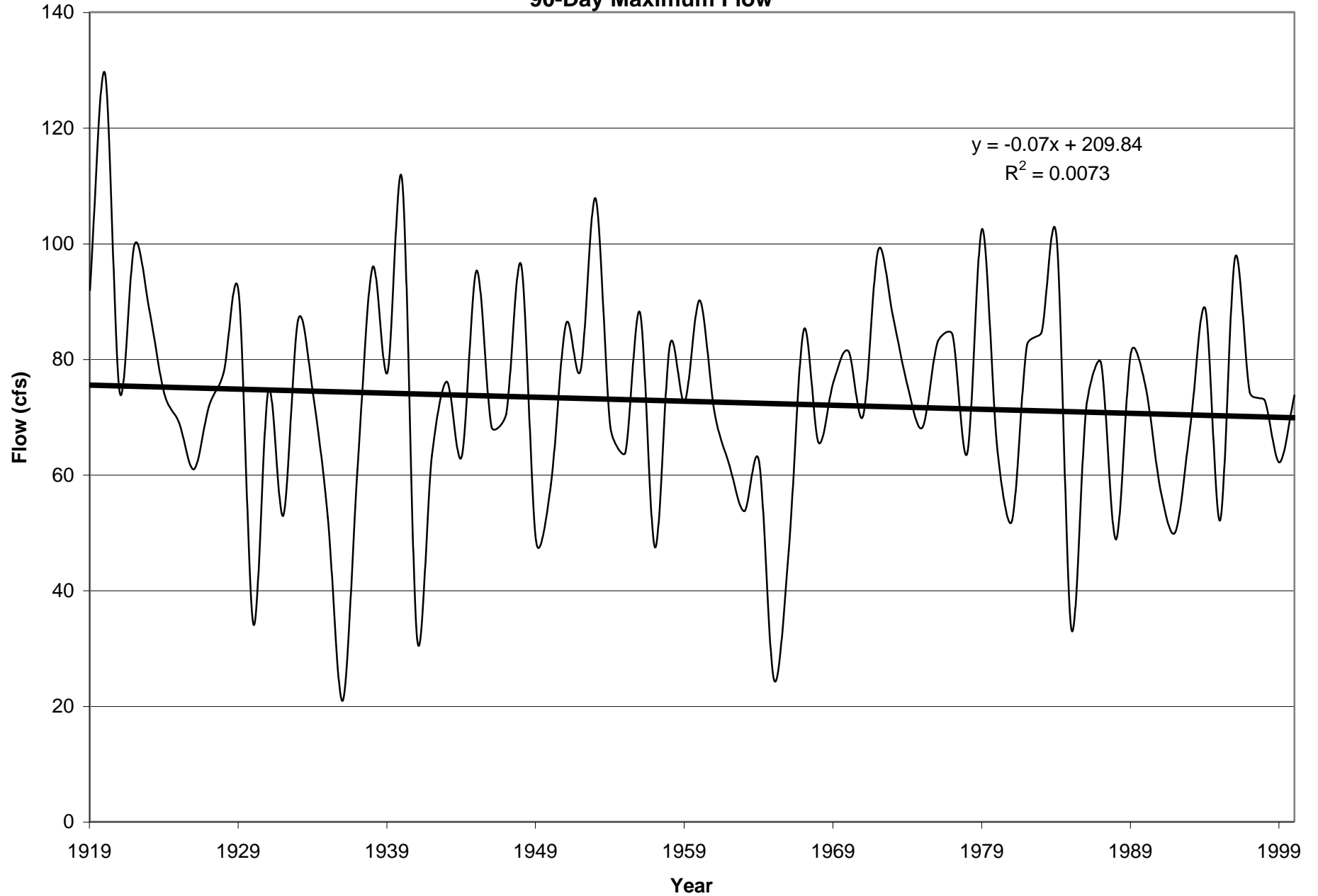
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**7-Day Maximum Flow**



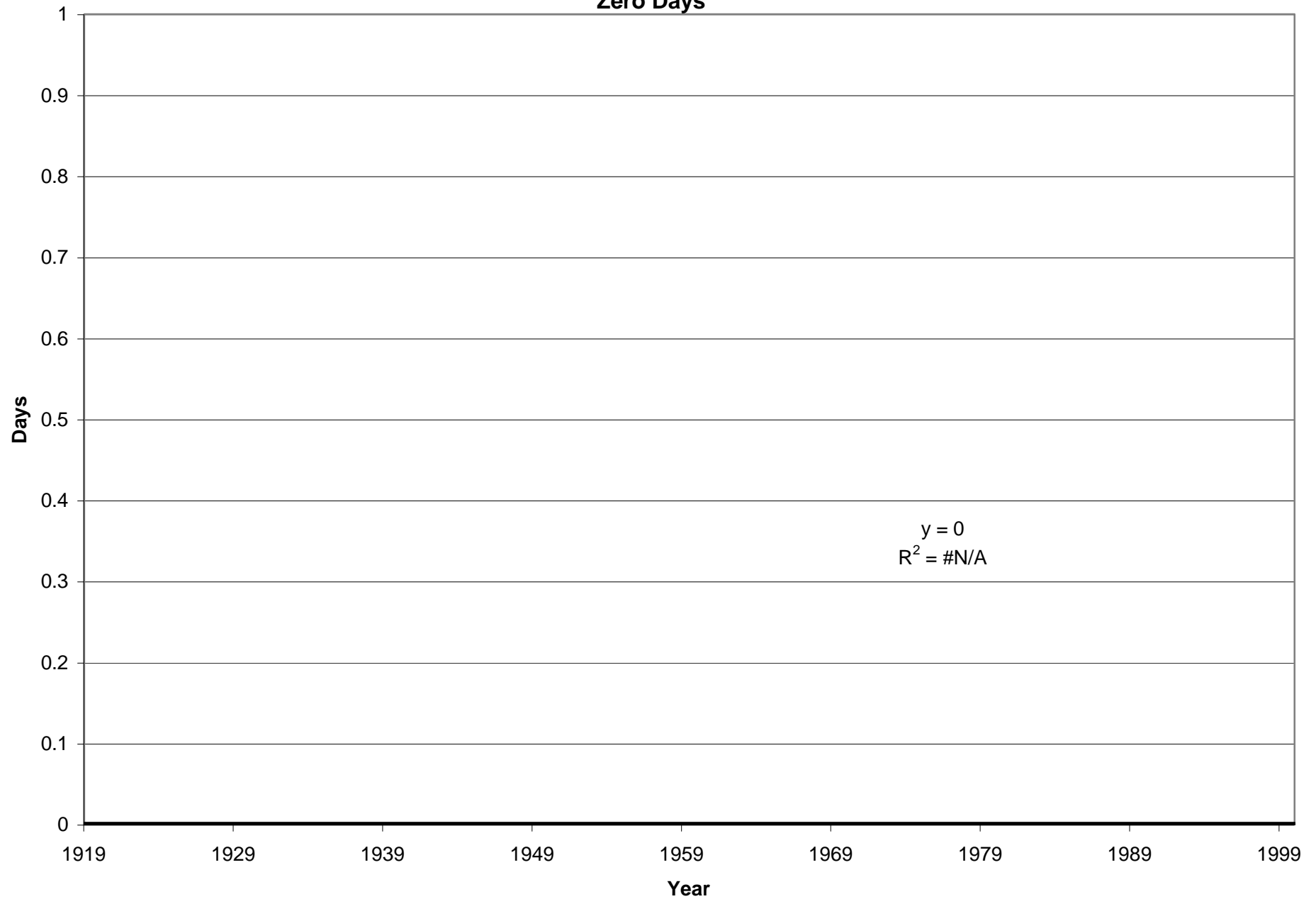
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**30-Day Maximum Flow**



**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**90-Day Maximum Flow**

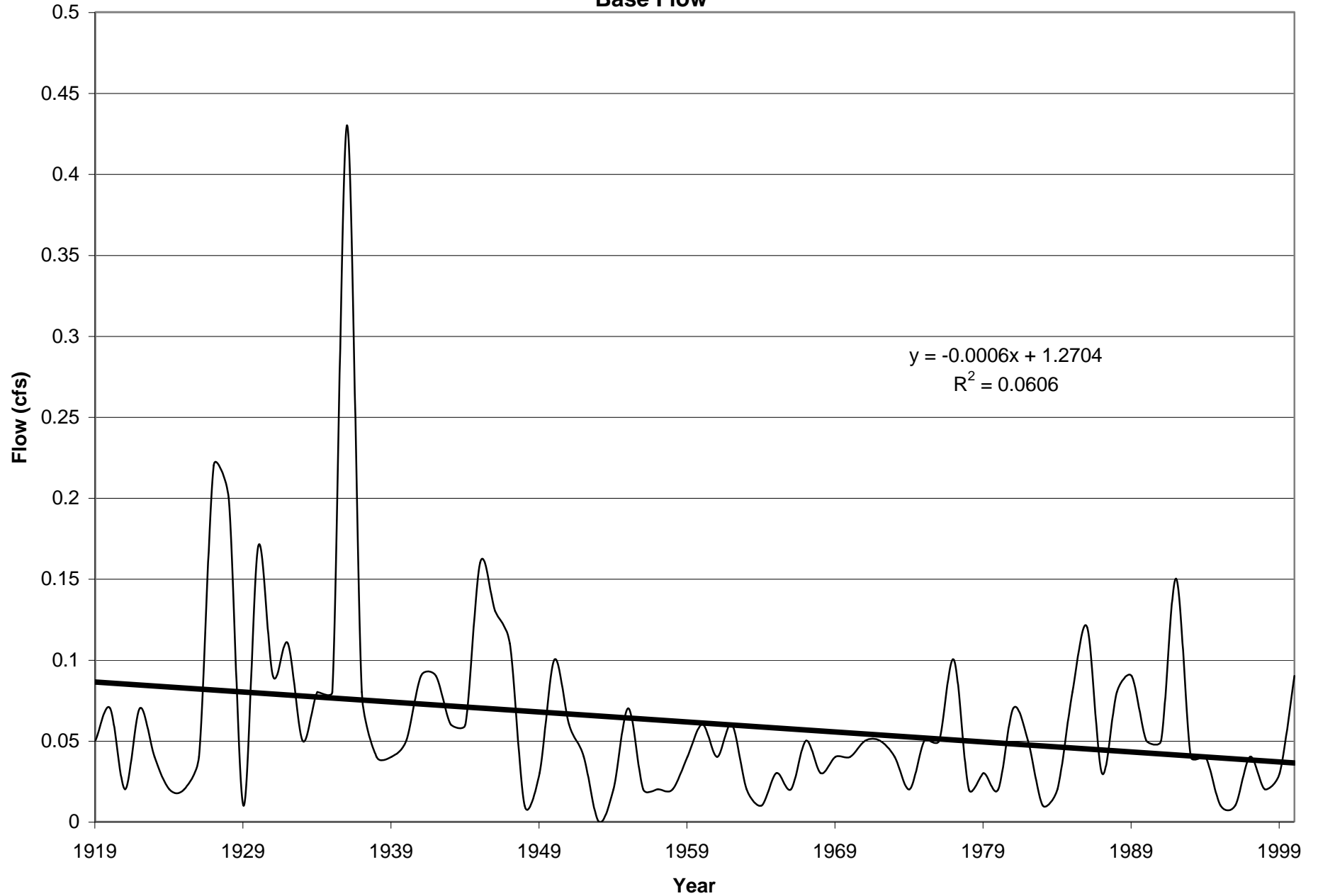


**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Zero Days**

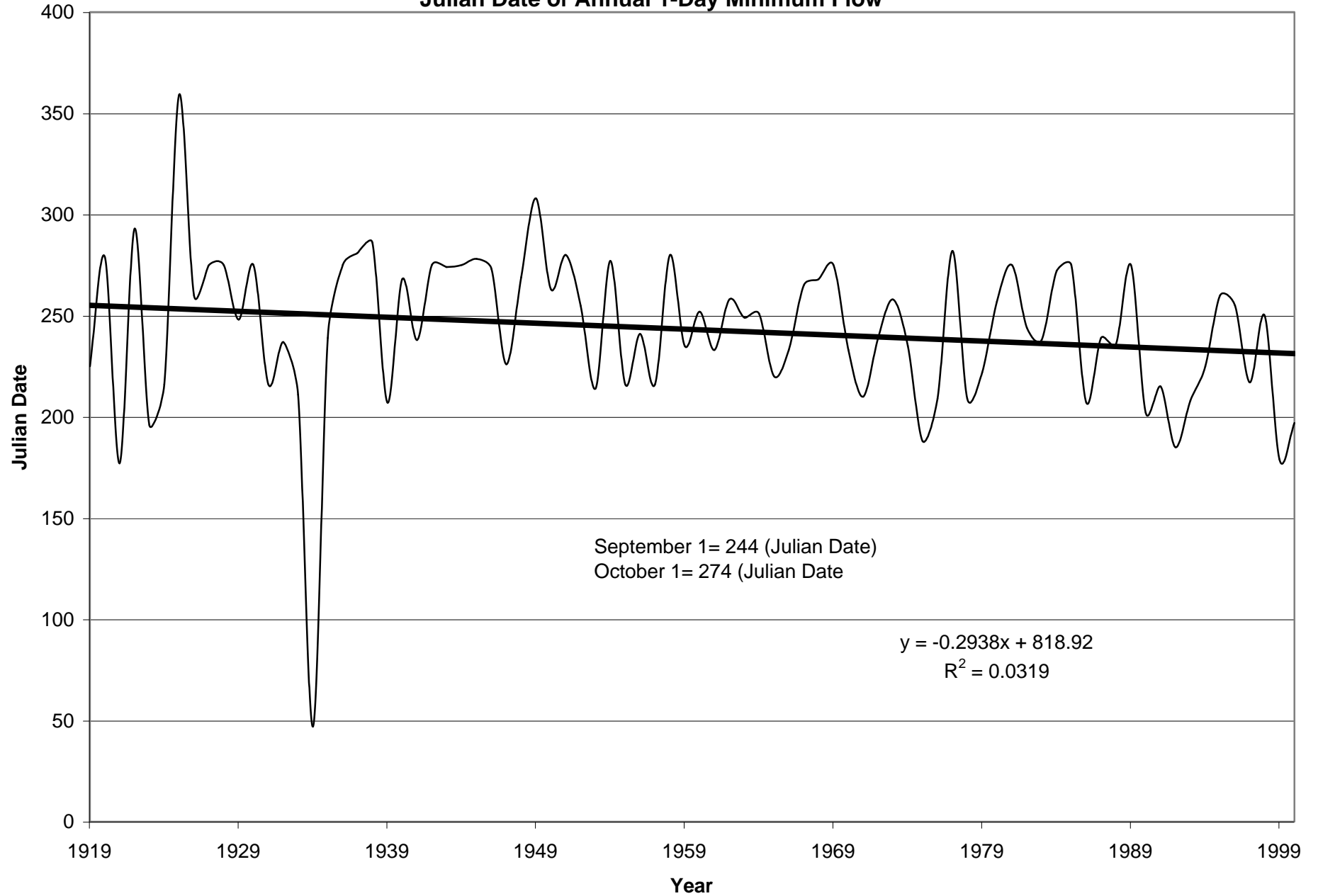




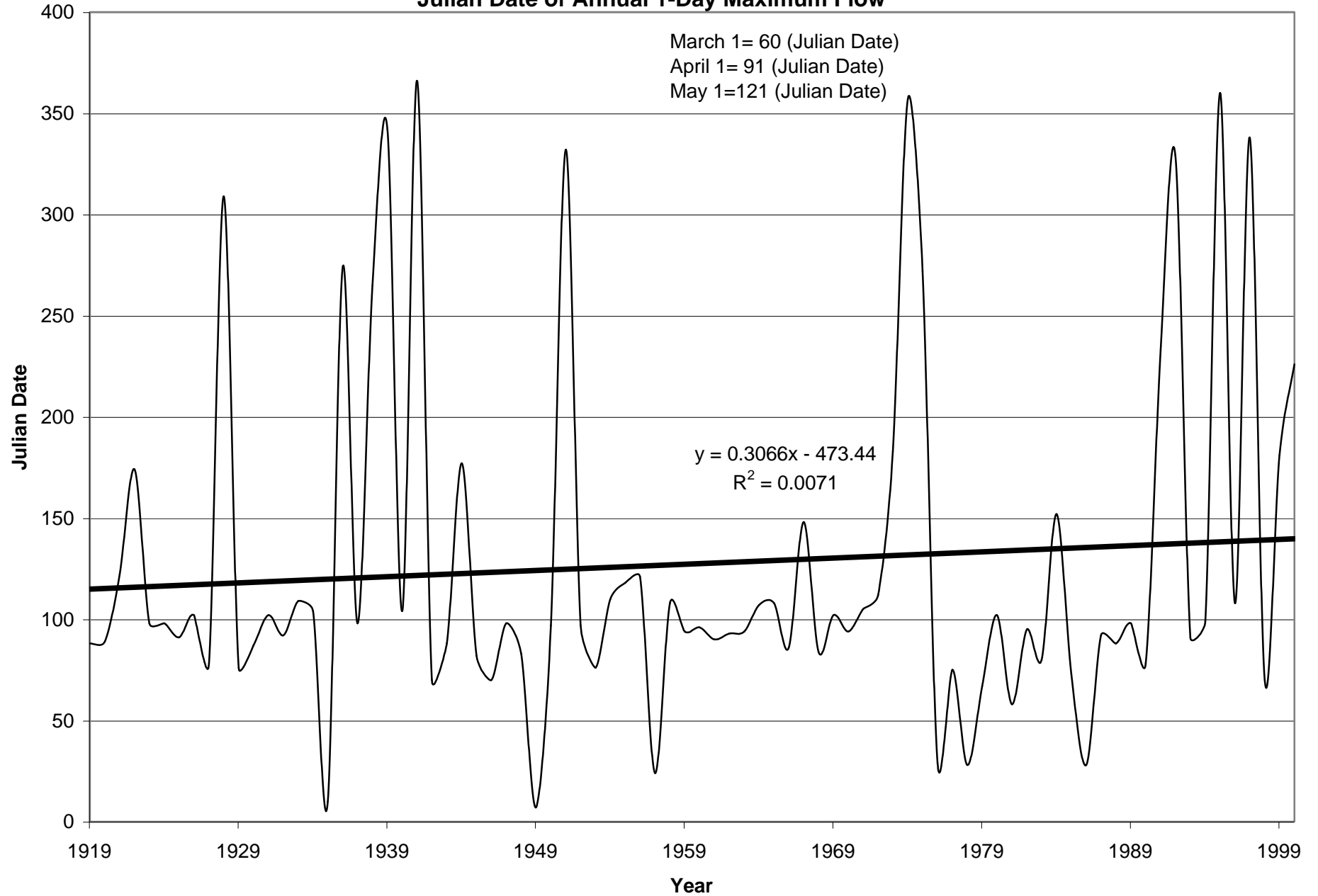
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Base Flow**



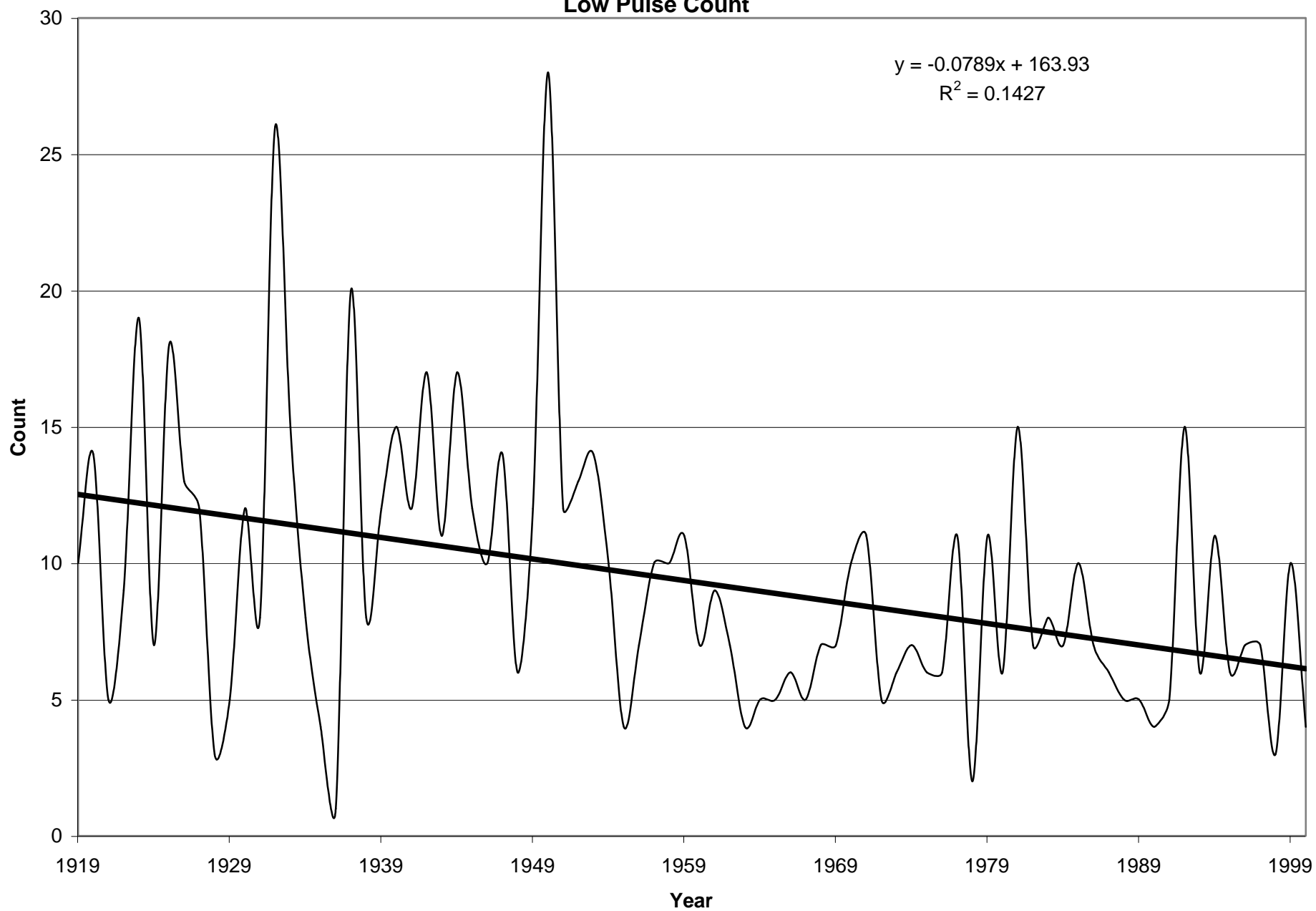
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Julian Date of Annual 1-Day Minimum Flow**



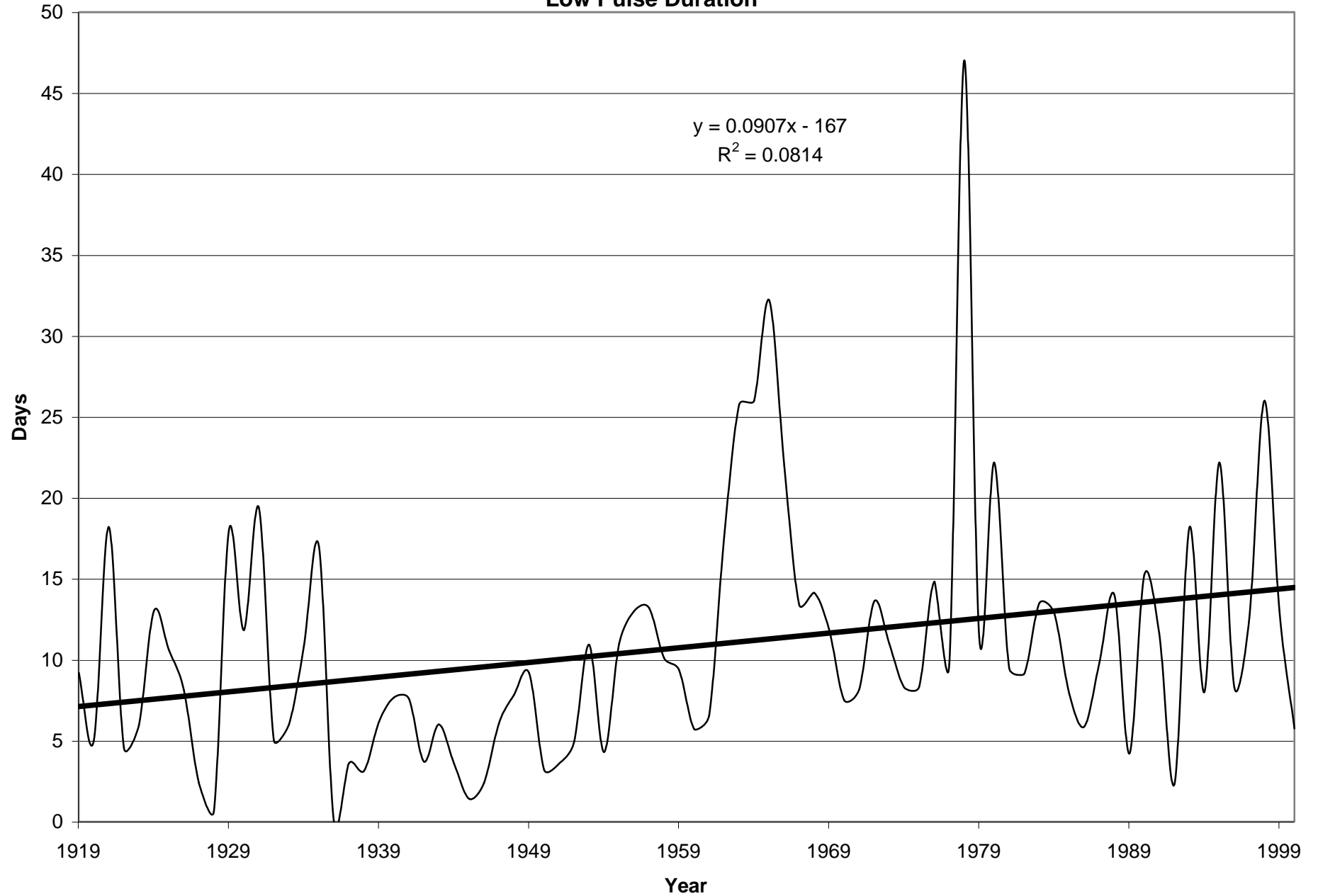
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Julian Date of Annual 1-Day Maximum Flow**



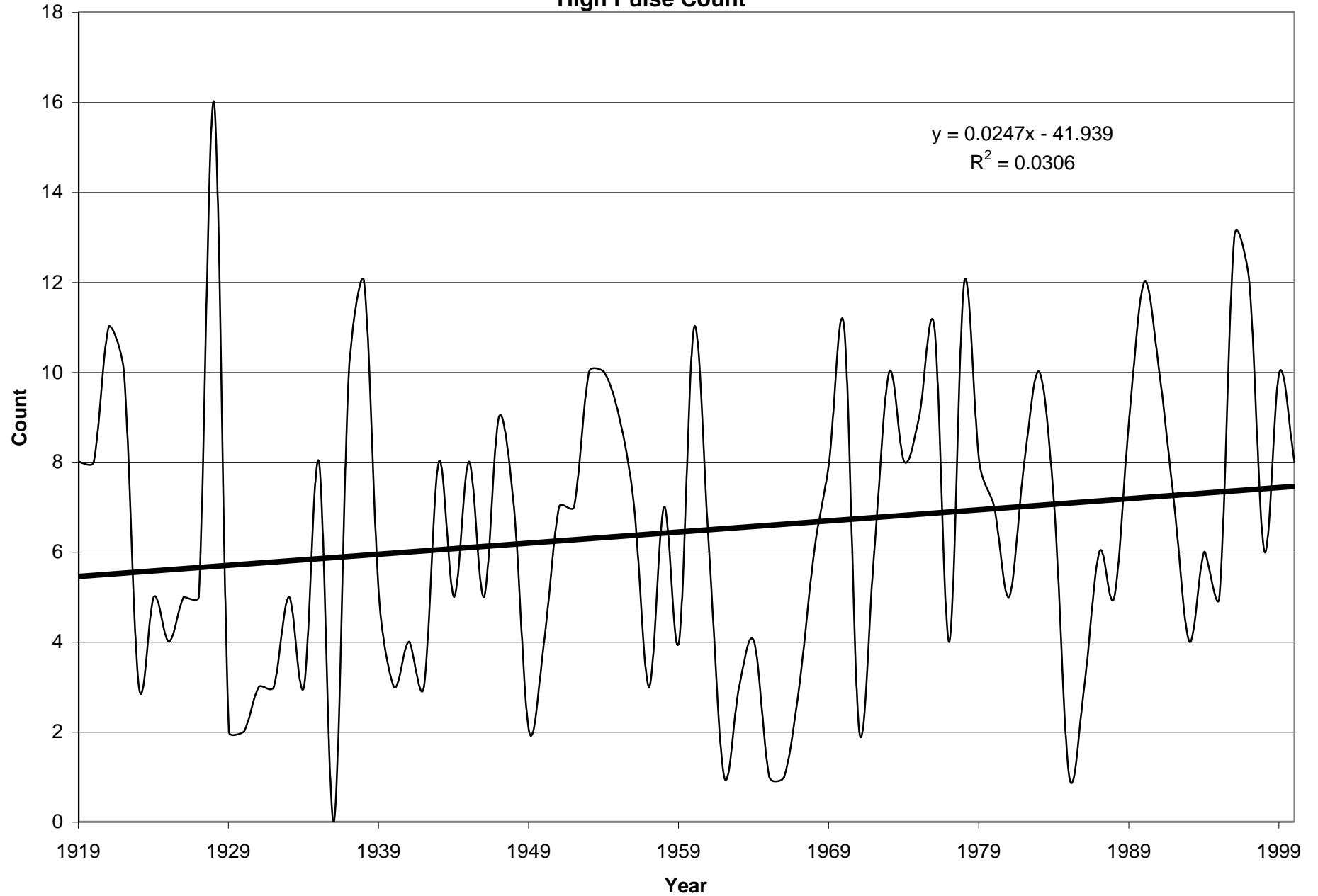
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Low Pulse Count**



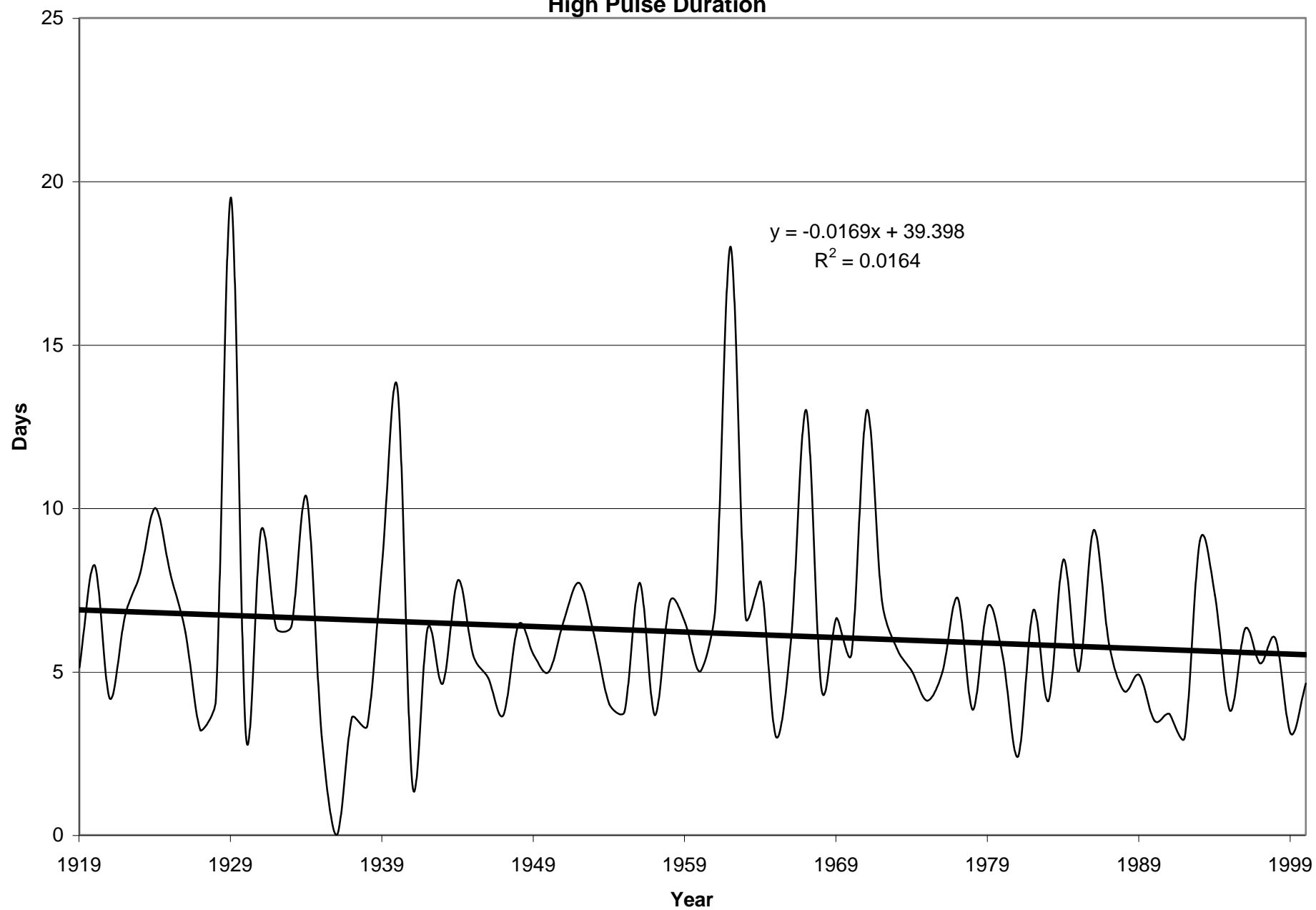
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Low Pulse Duration**



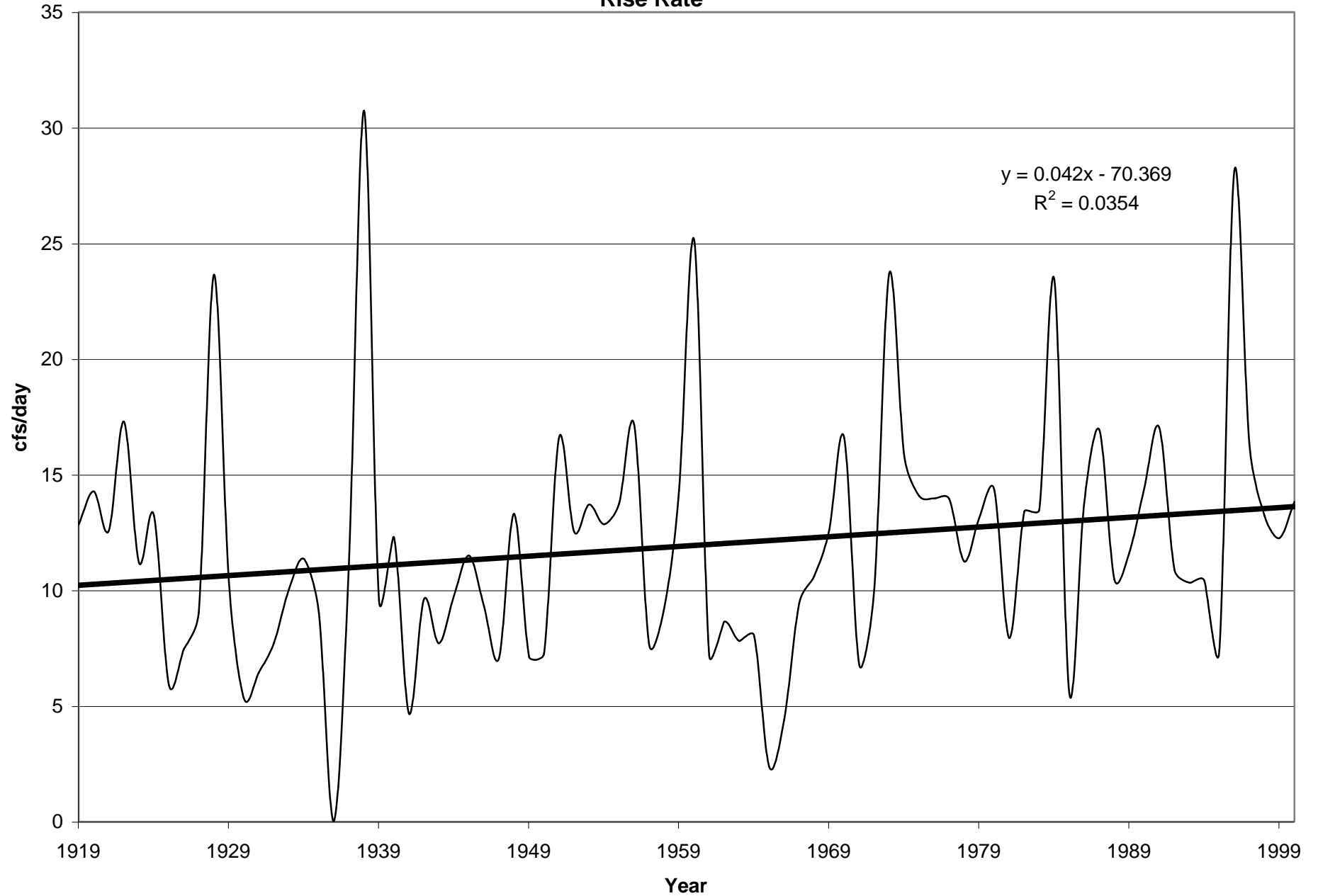
**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**High Pulse Count**



**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**High Pulse Duration**

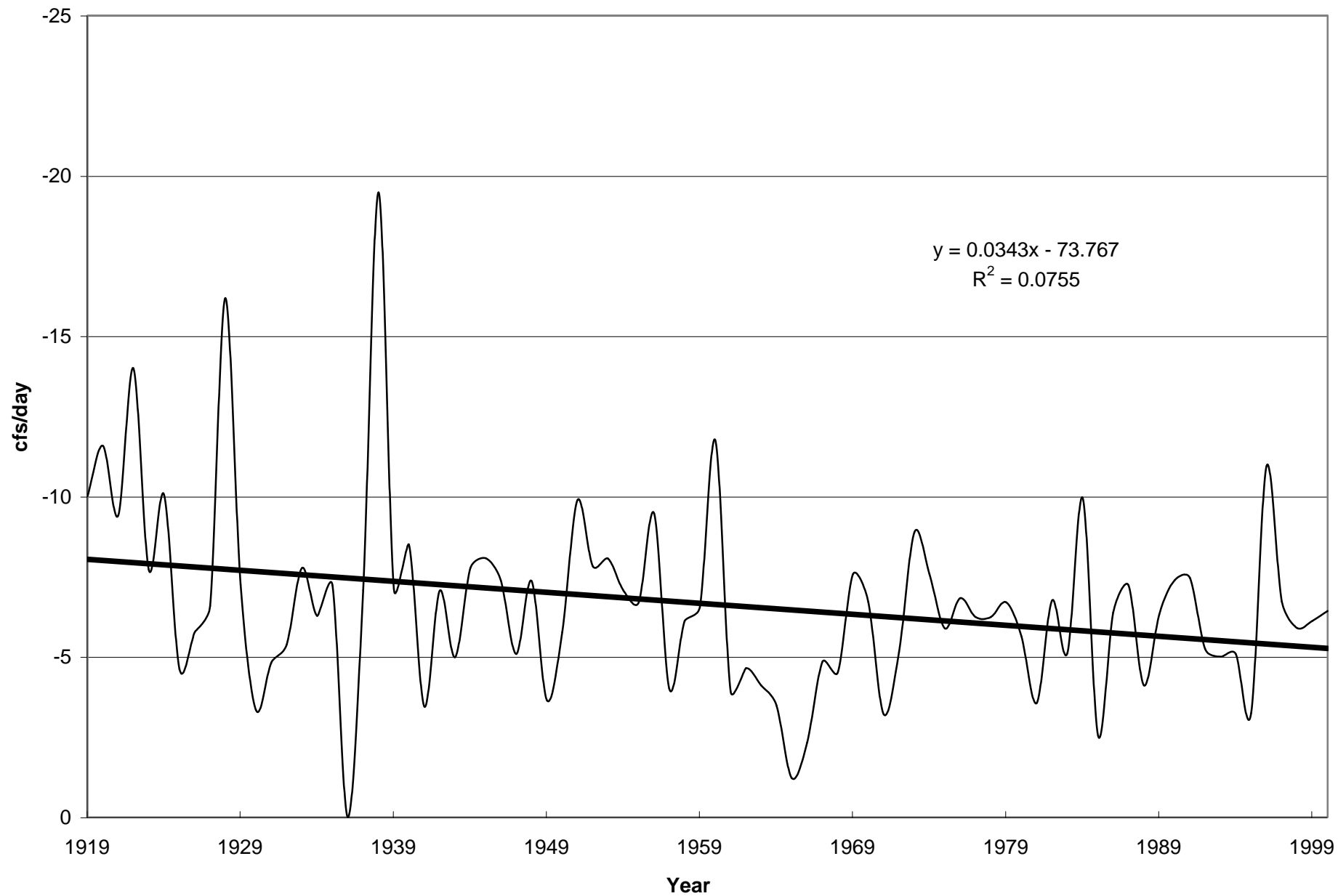


**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Rise Rate**

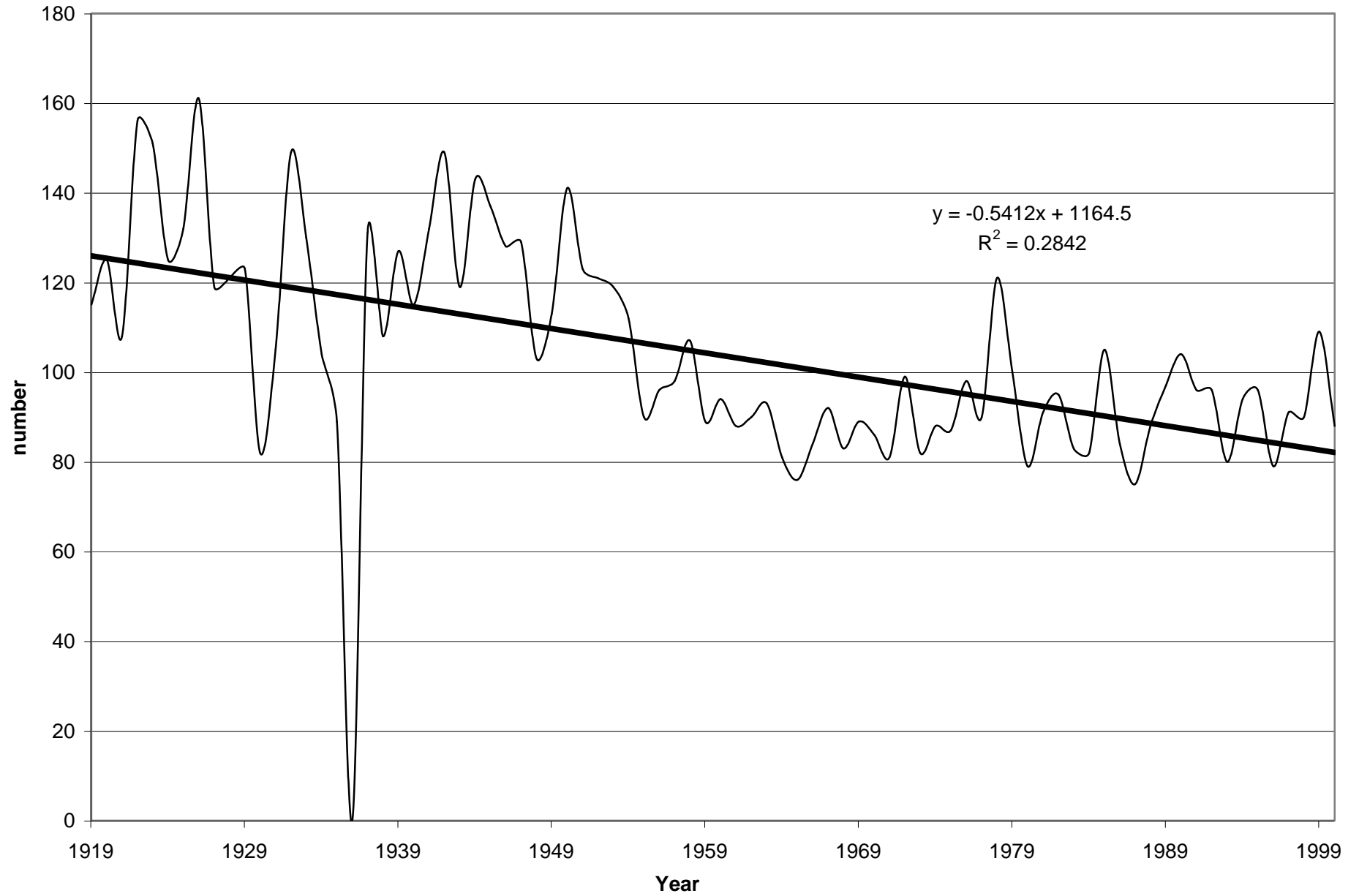




Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi  
Fall Rate



**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**Reversals**

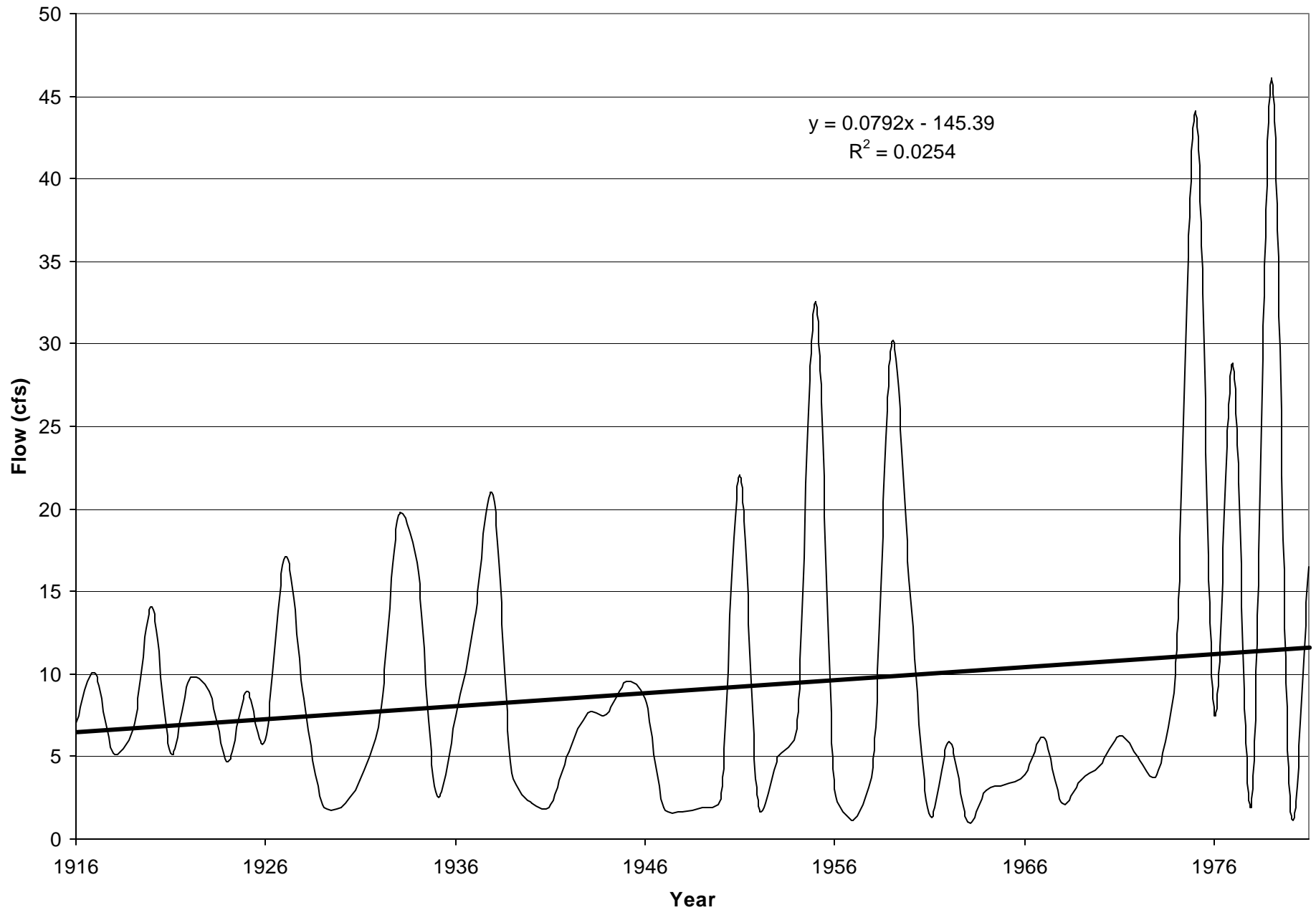


**Moss Brook at Wendell Depot, MA**  
**Drainage Area= 12.1 square miles**  
**Period of Record: Water Years 1916-1981**  
***IHA Results***

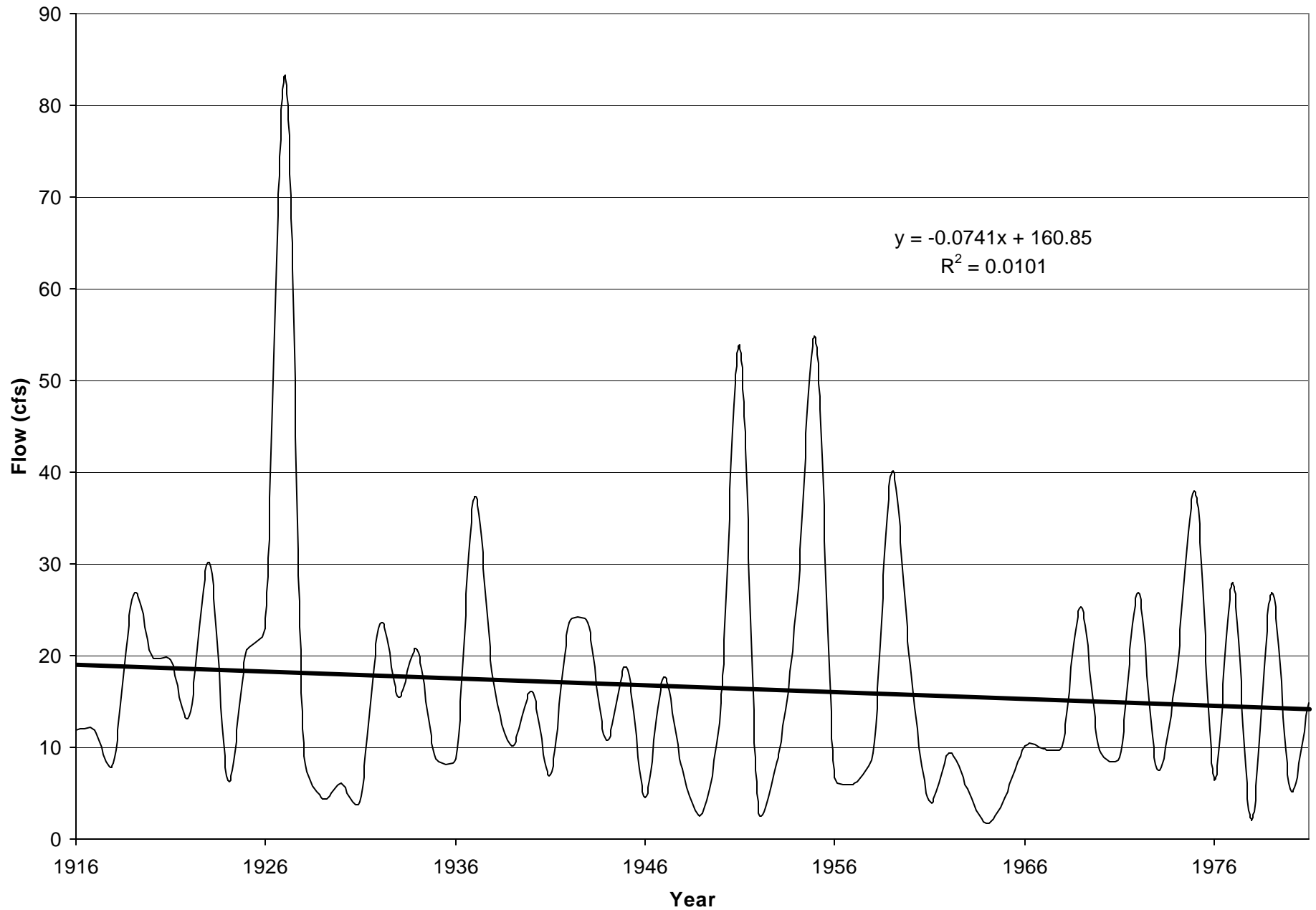
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1. Average Monthly Flow for October
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26. Julian Date of Annual 1-Day Maximum Flow
27. Low Pulse Count
28. Low Pulse Duration
29. High Pulse Count
30. High Pulse Duration
31. Rise Rate
32. Fall Rate
33. Reversals

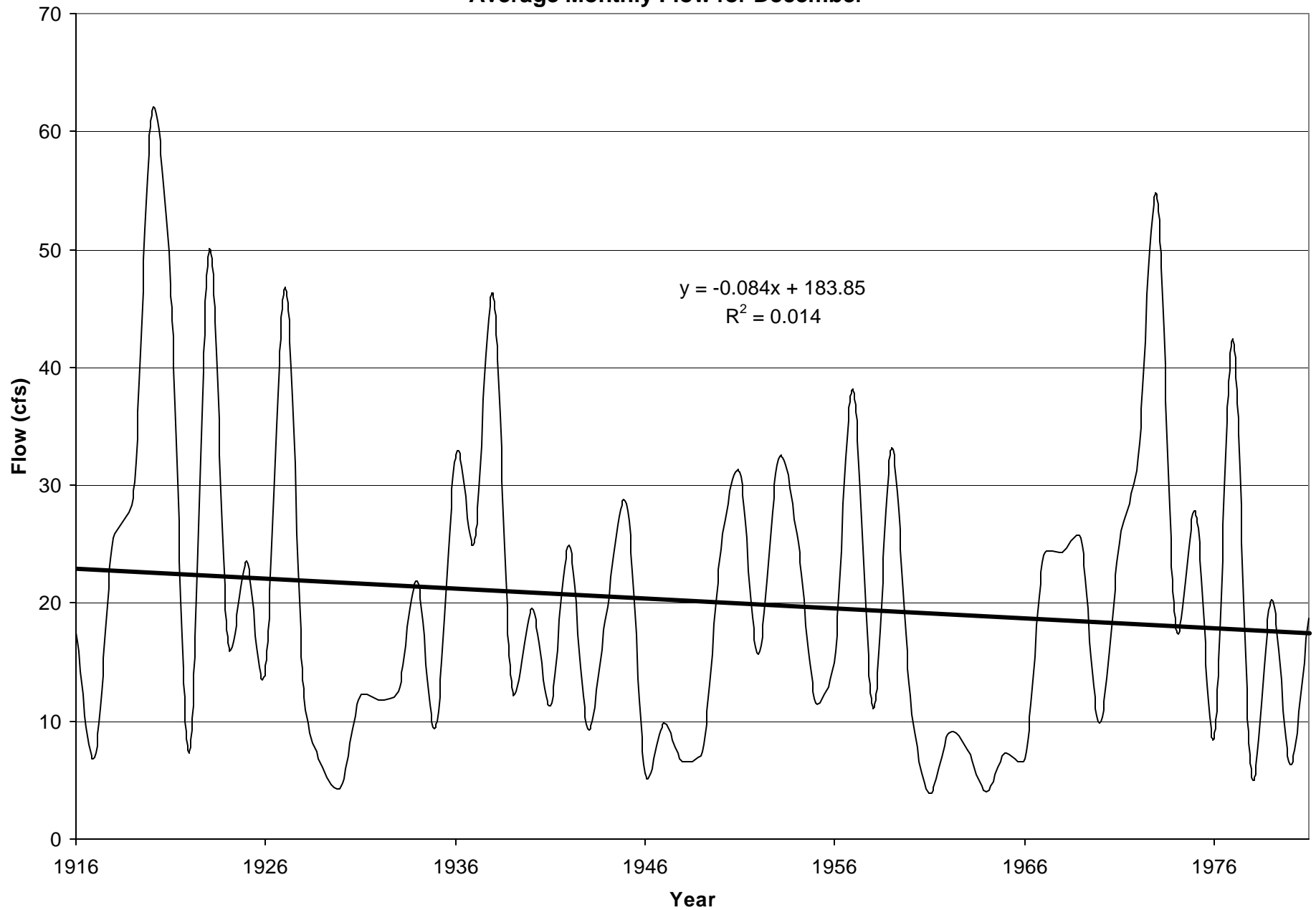
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for October**



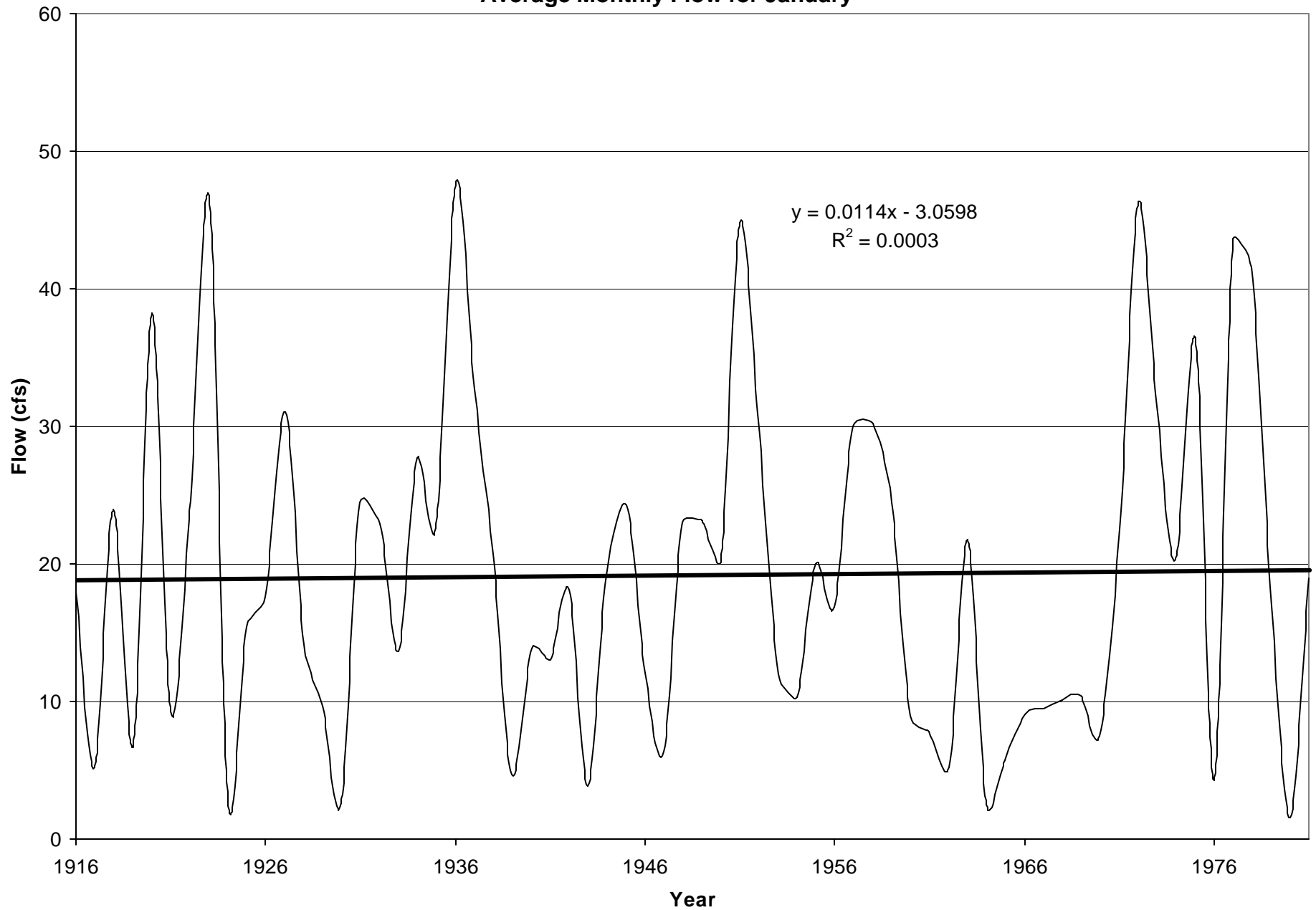
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for November**



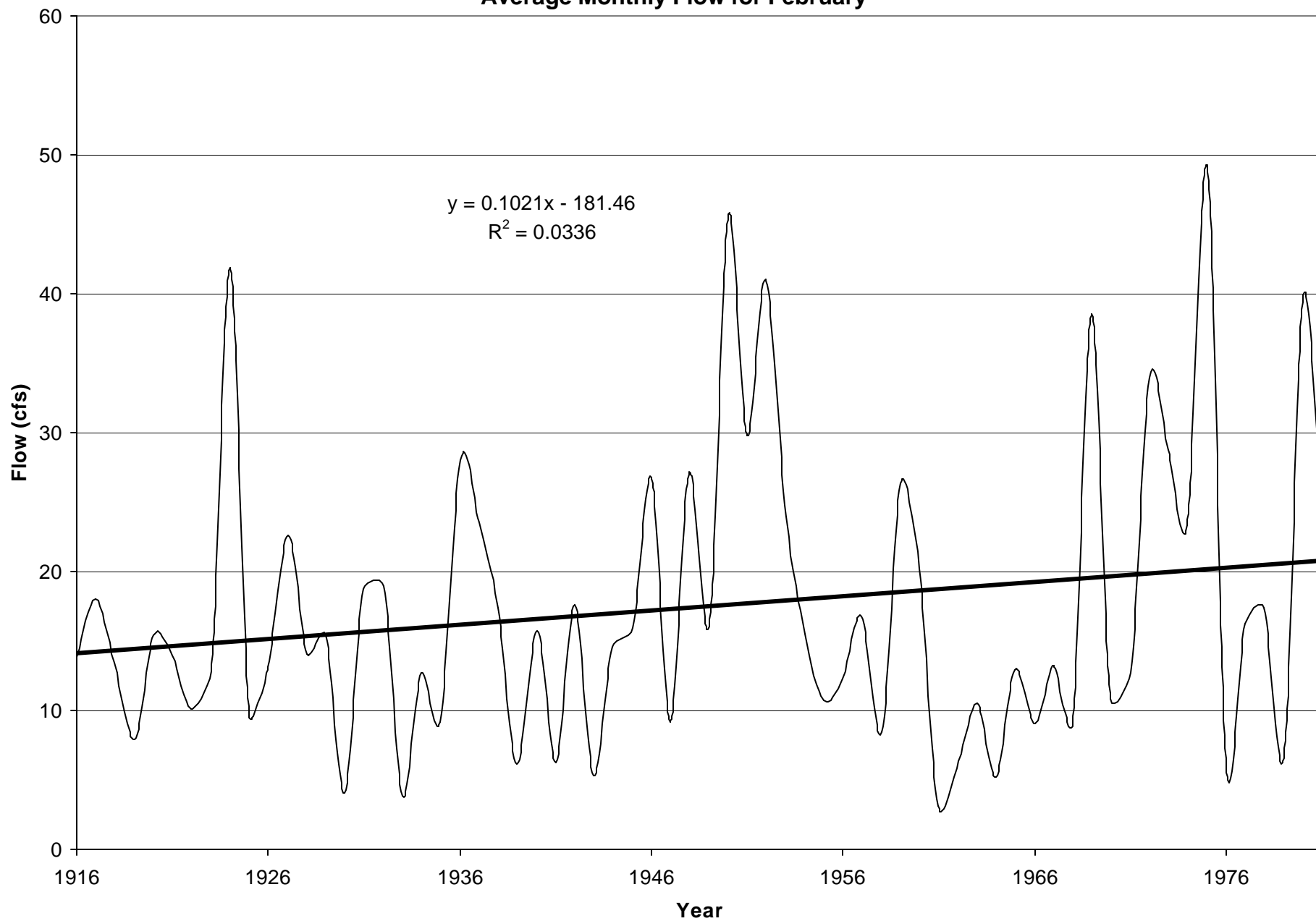
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for December**



**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for January**

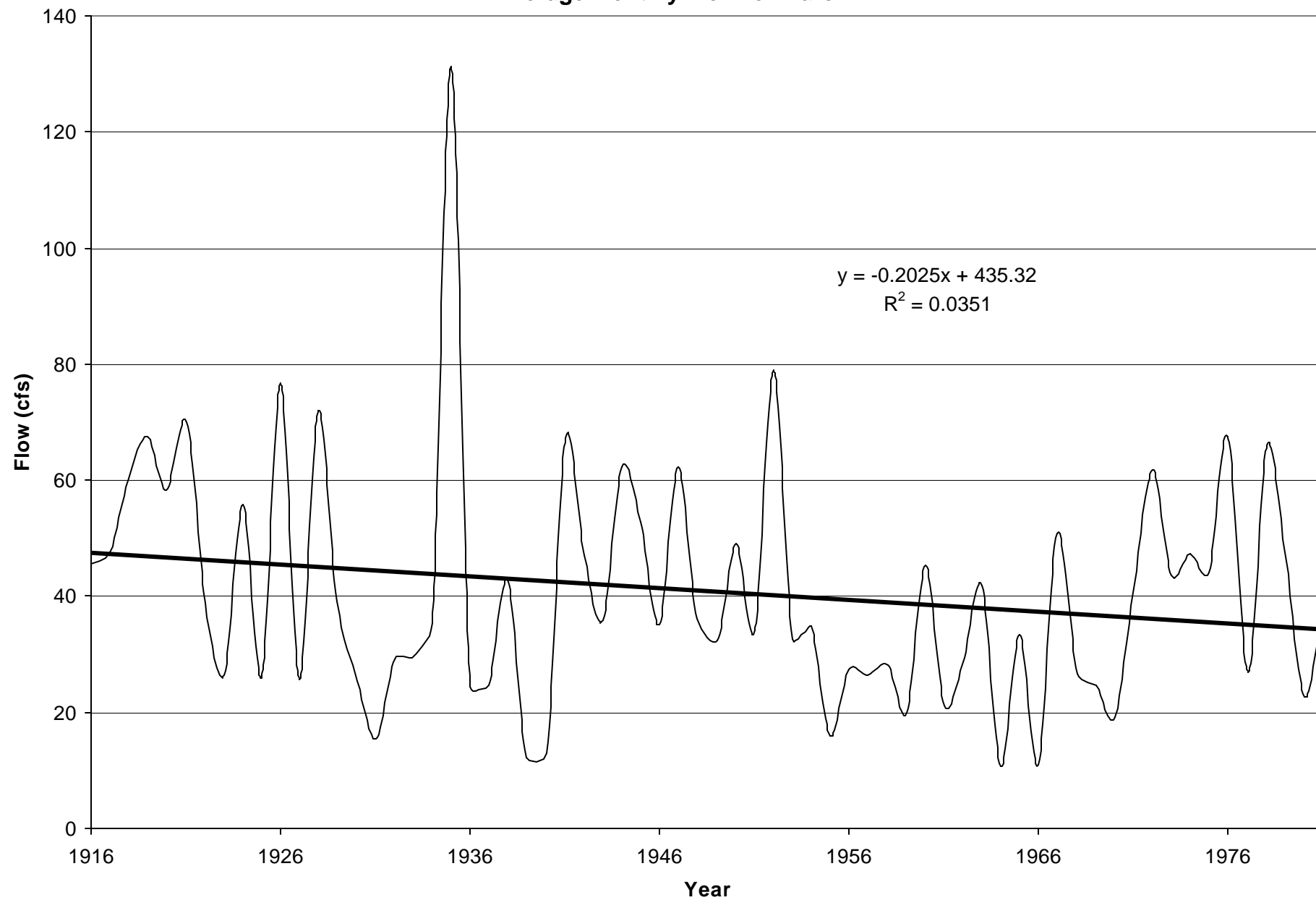


**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for February**

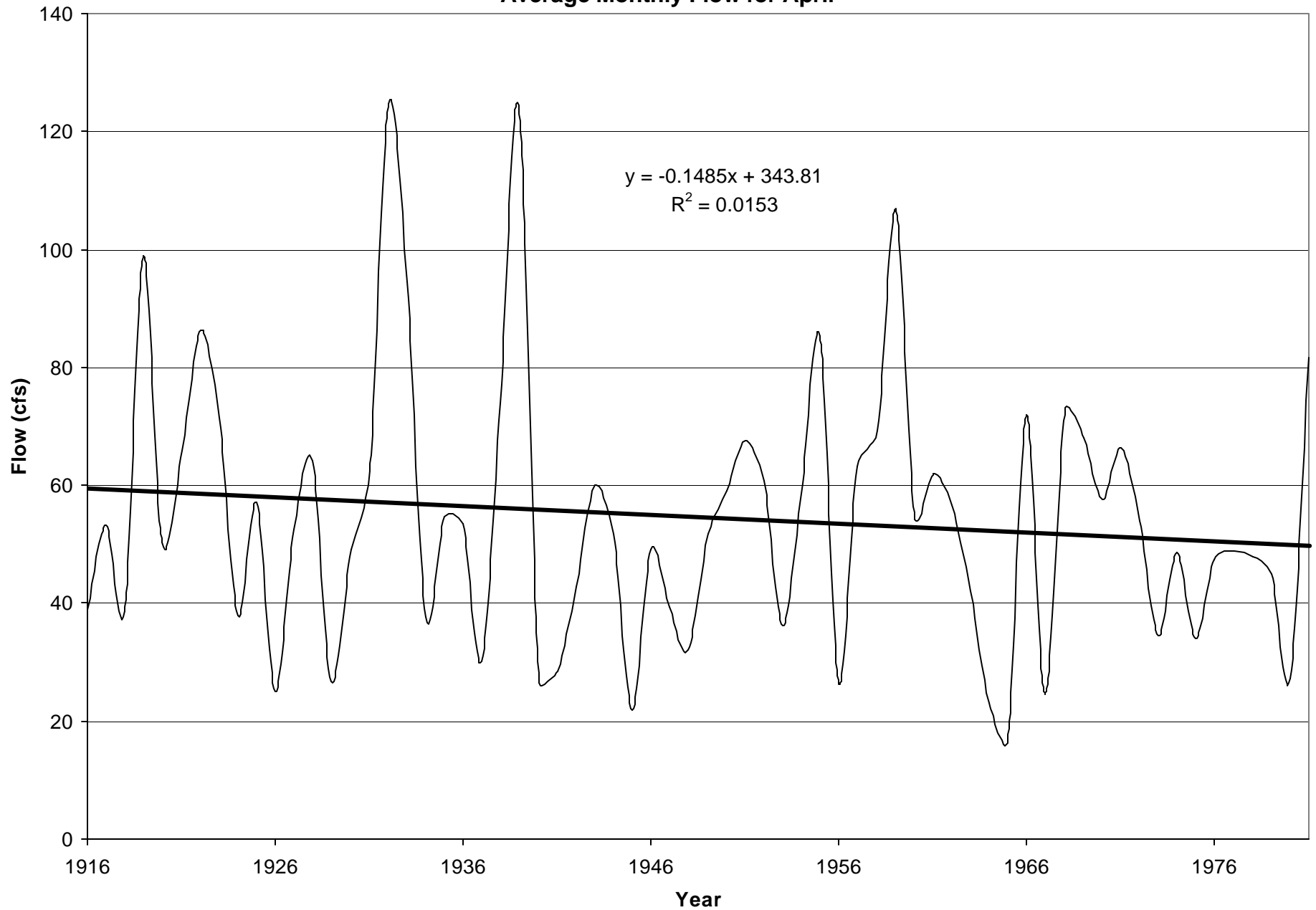




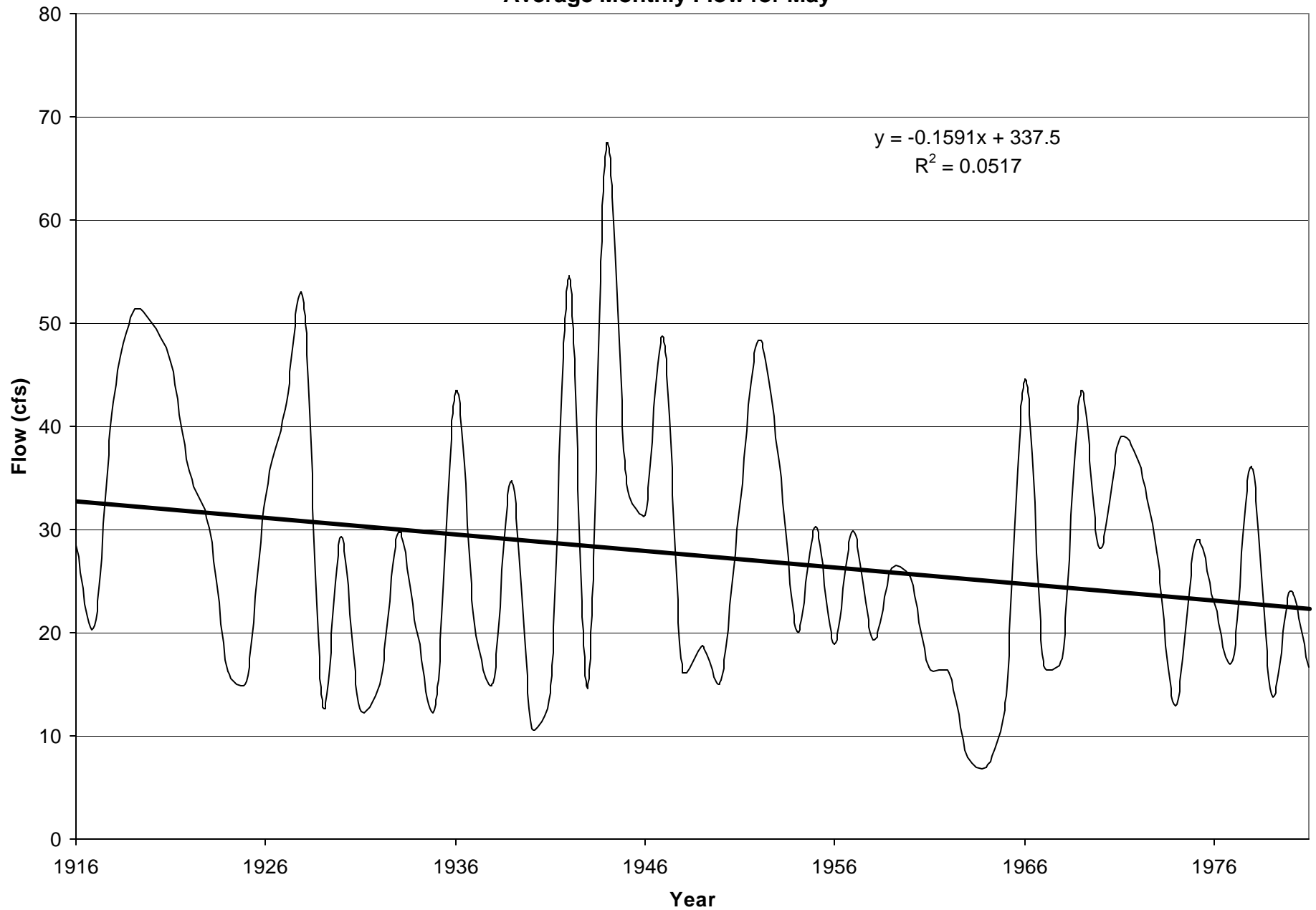
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for March**



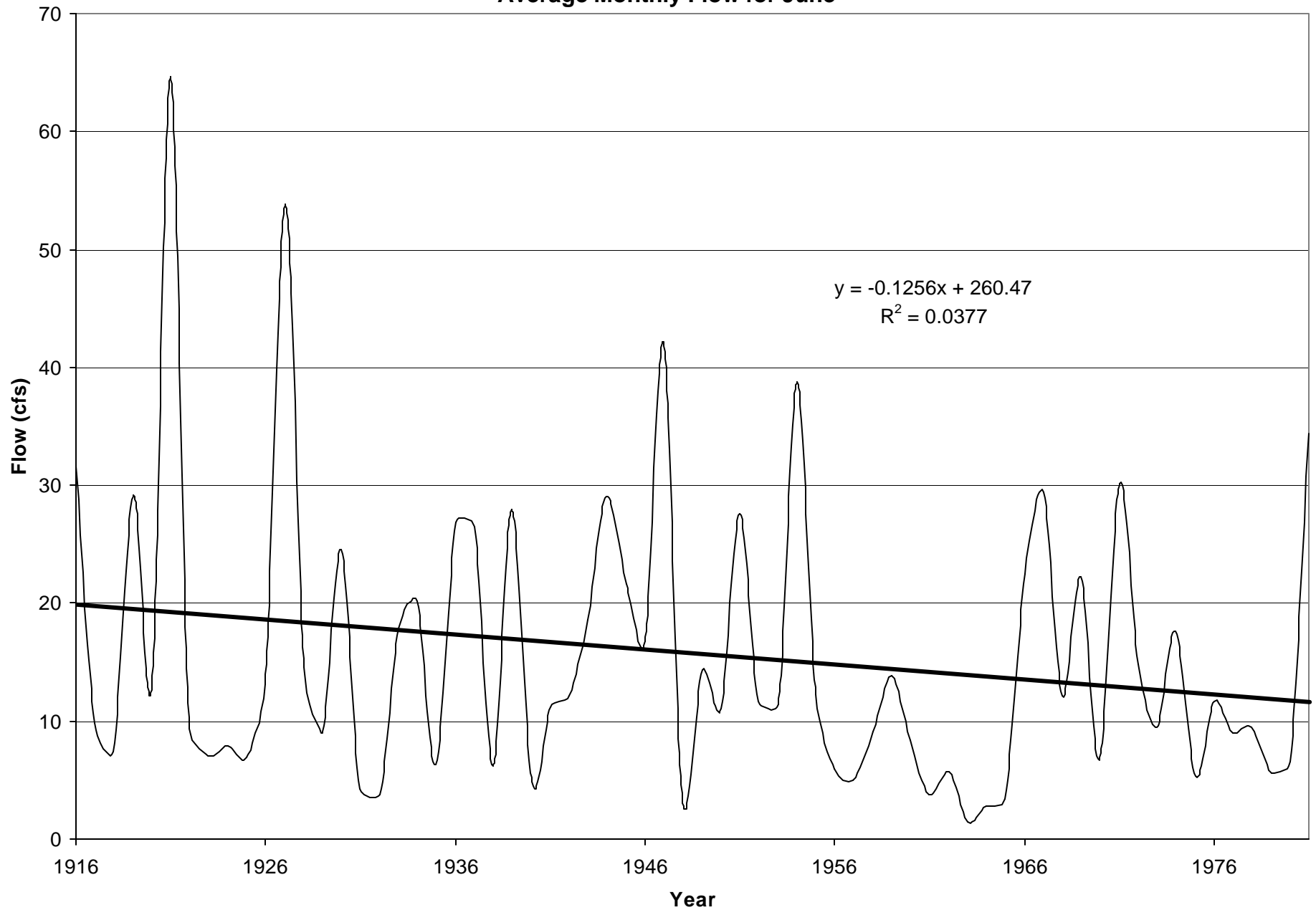
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for April**



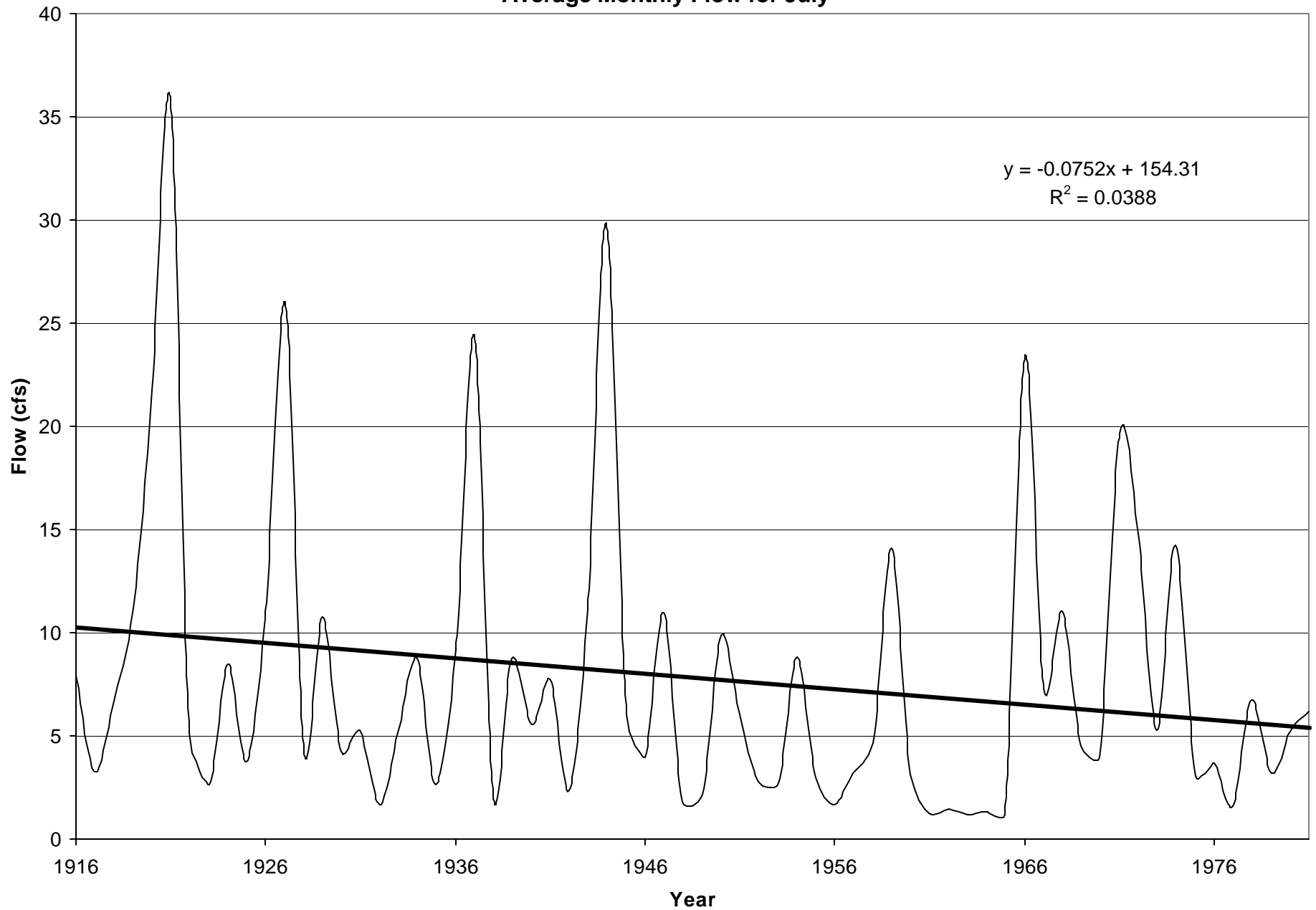
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for May**



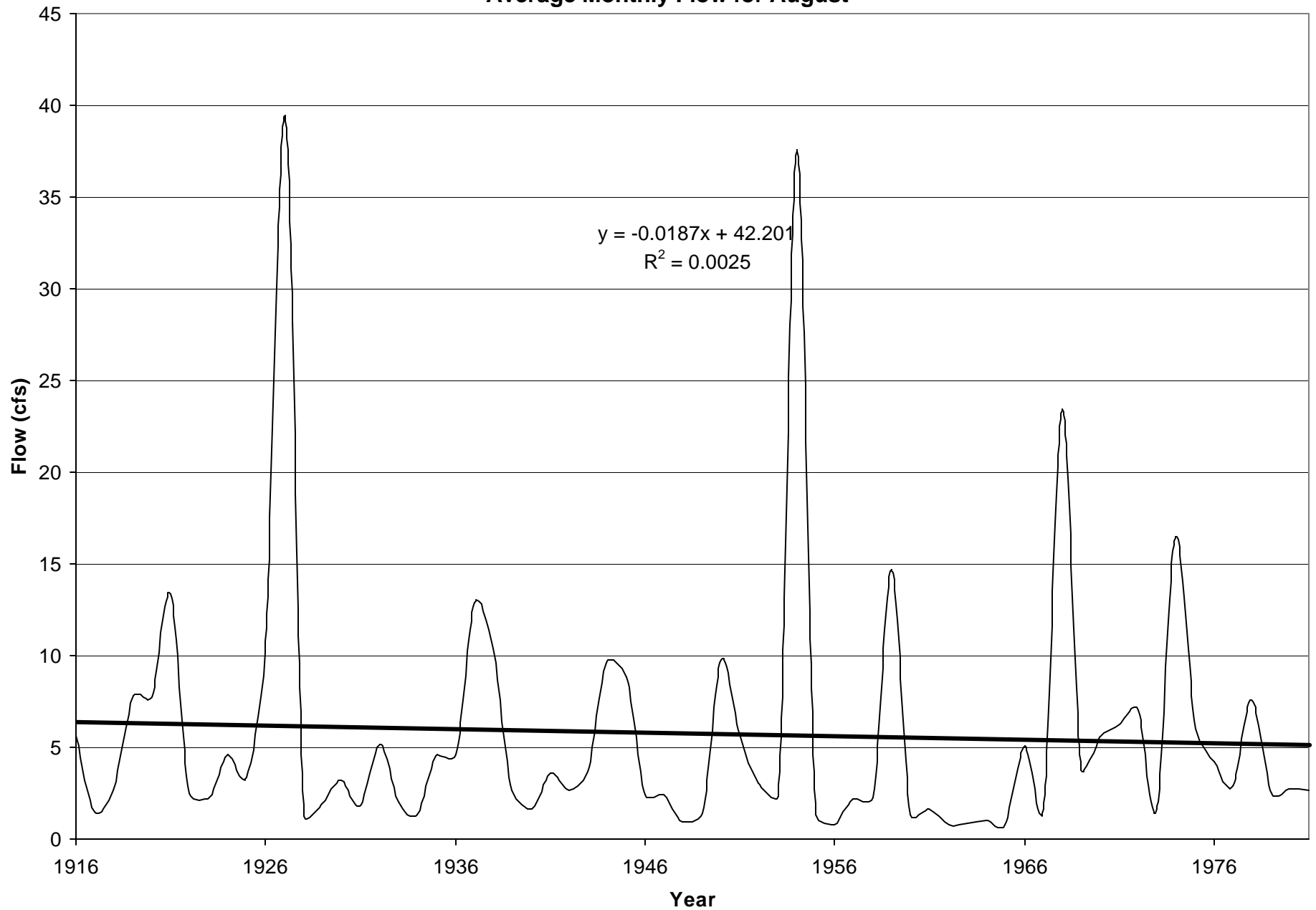
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for June**



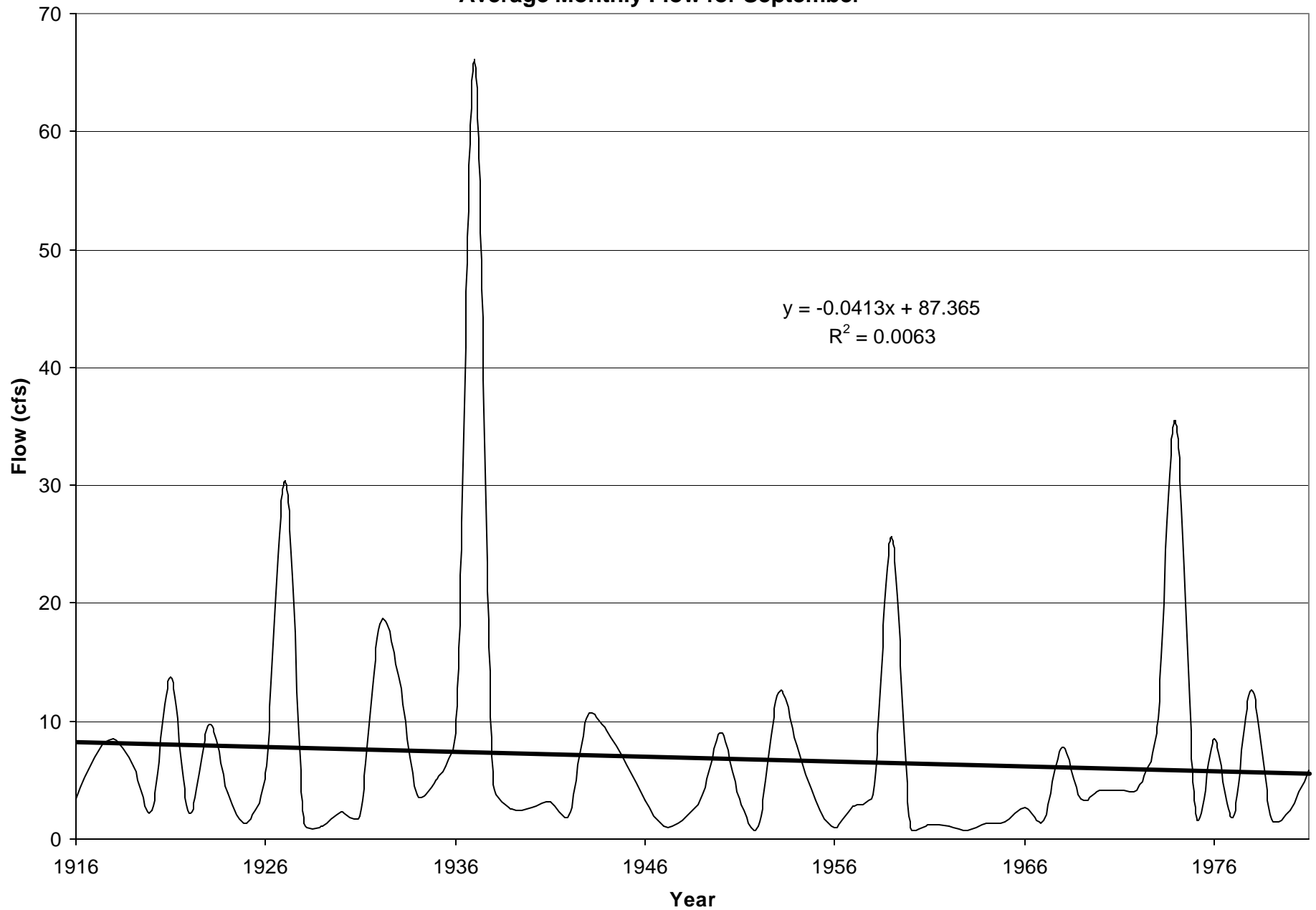
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for July**



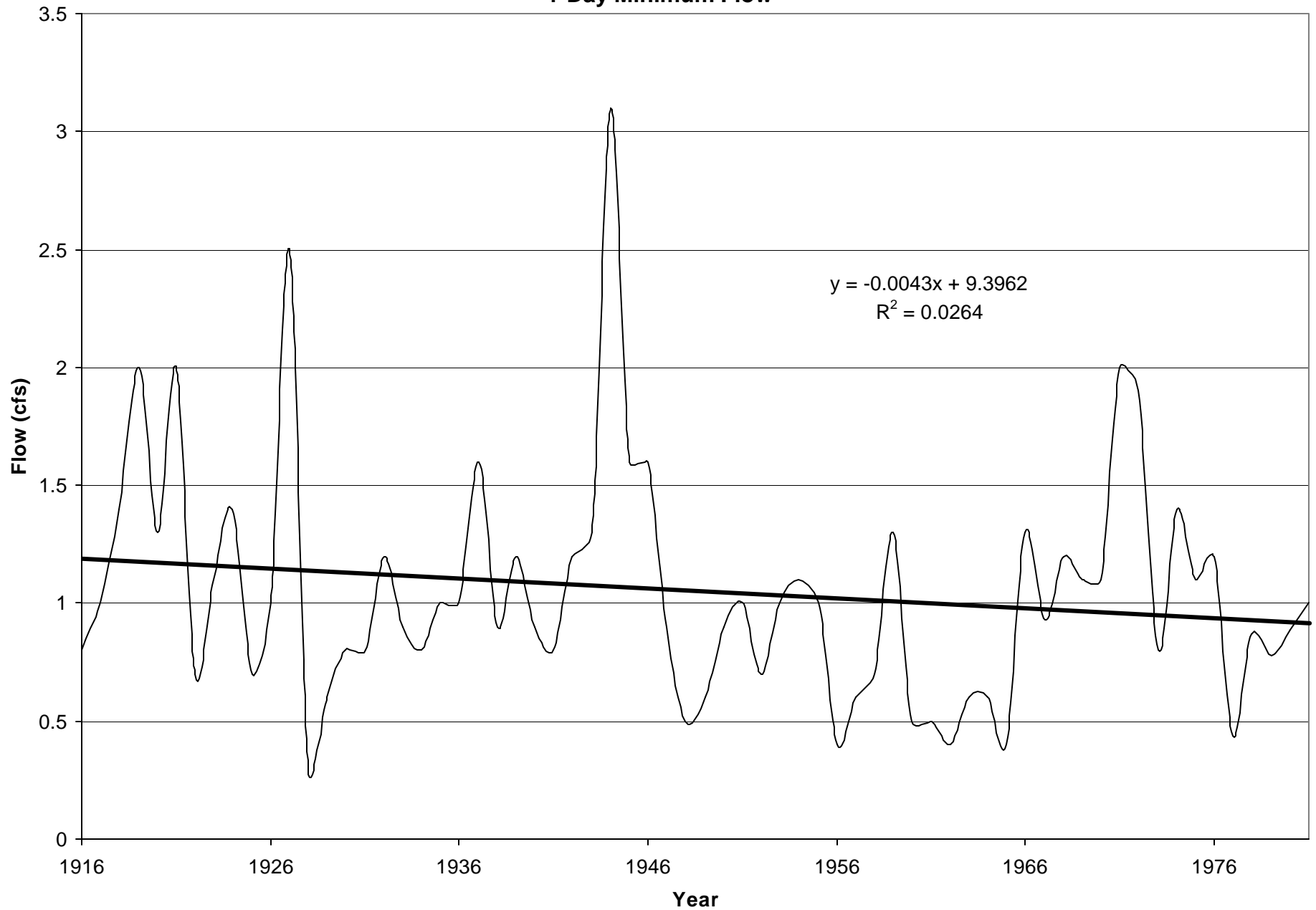
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for August**



**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Average Monthly Flow for September**

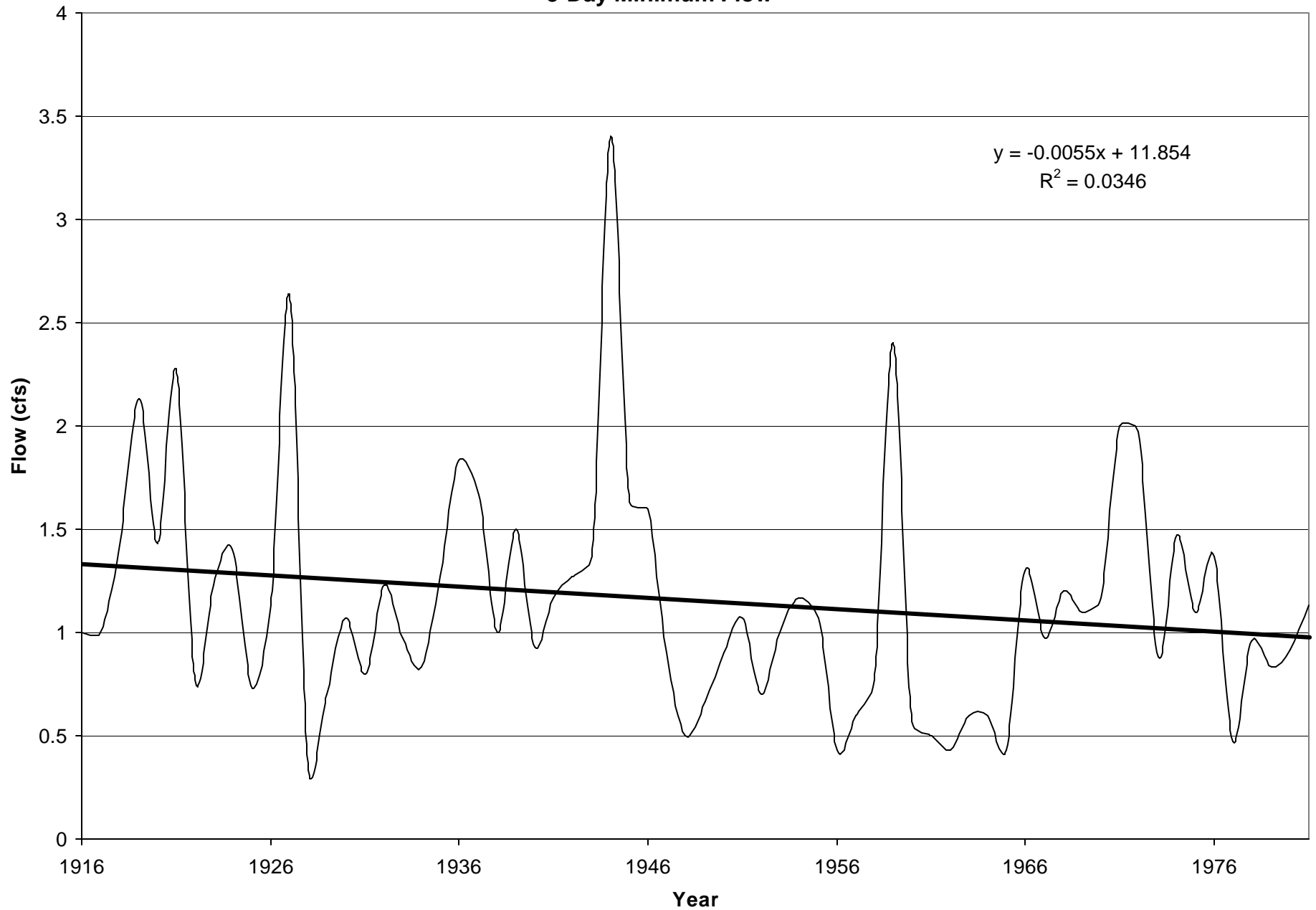


**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**1-Day Minimum Flow**

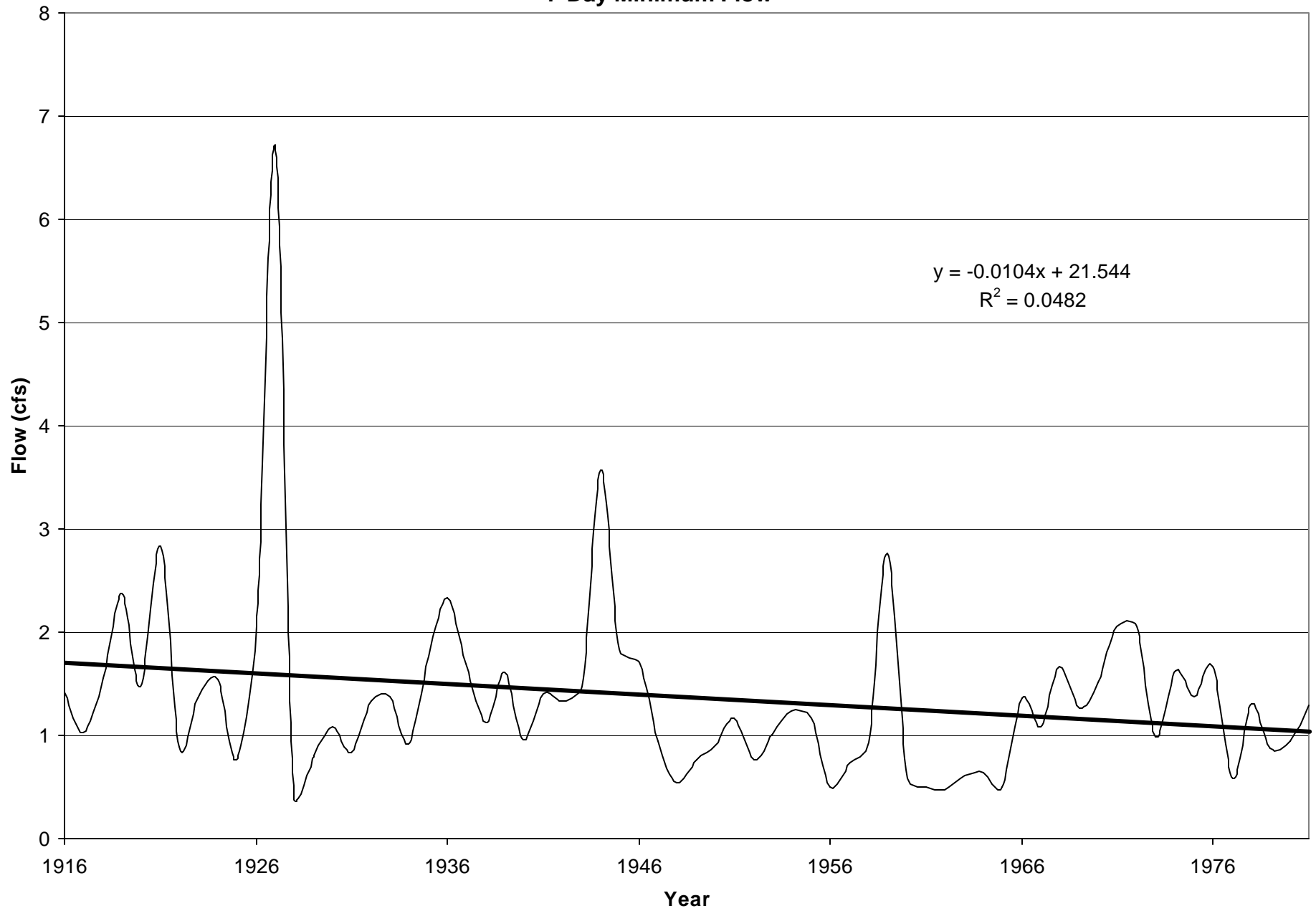




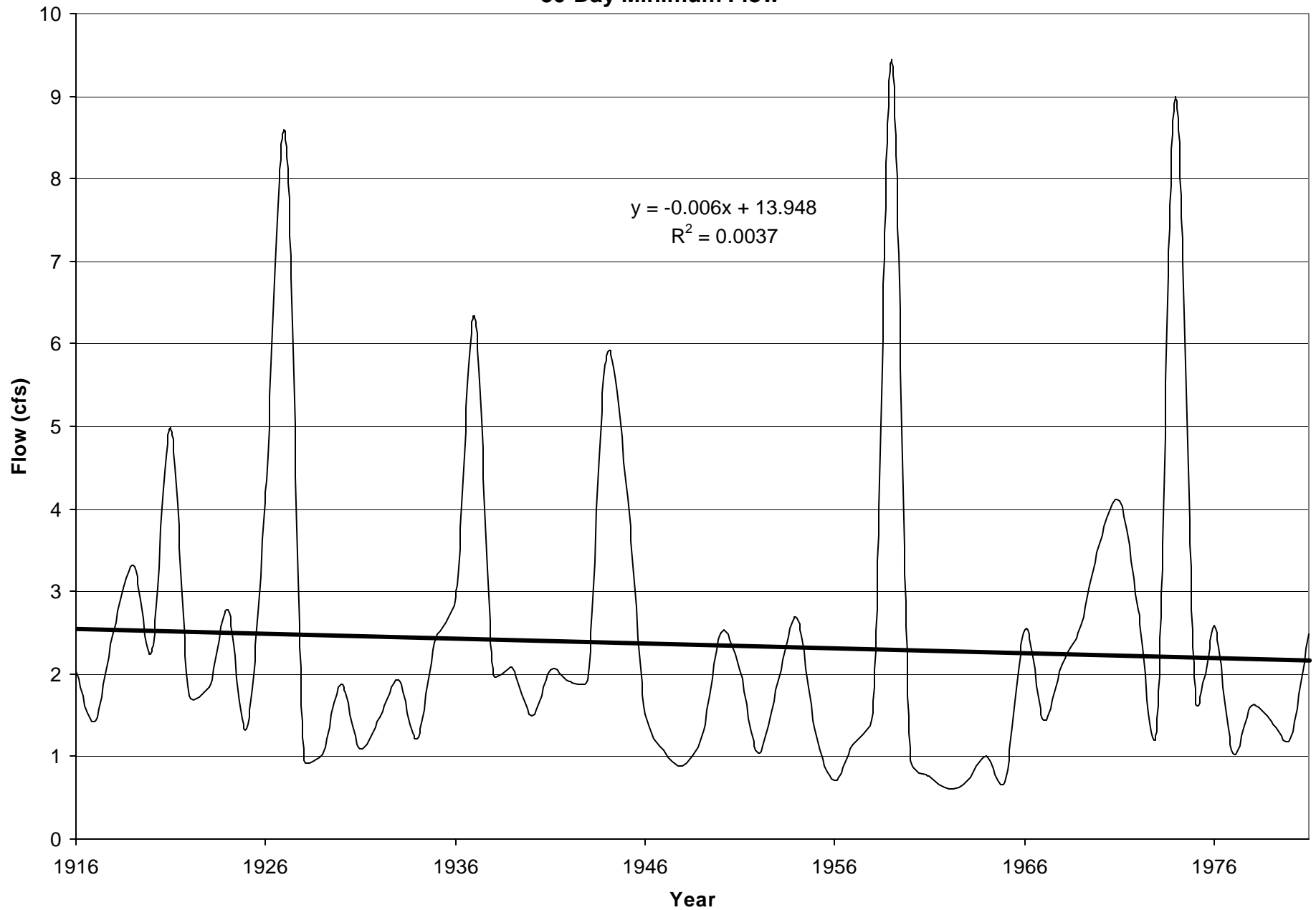
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**3-Day Minimum Flow**



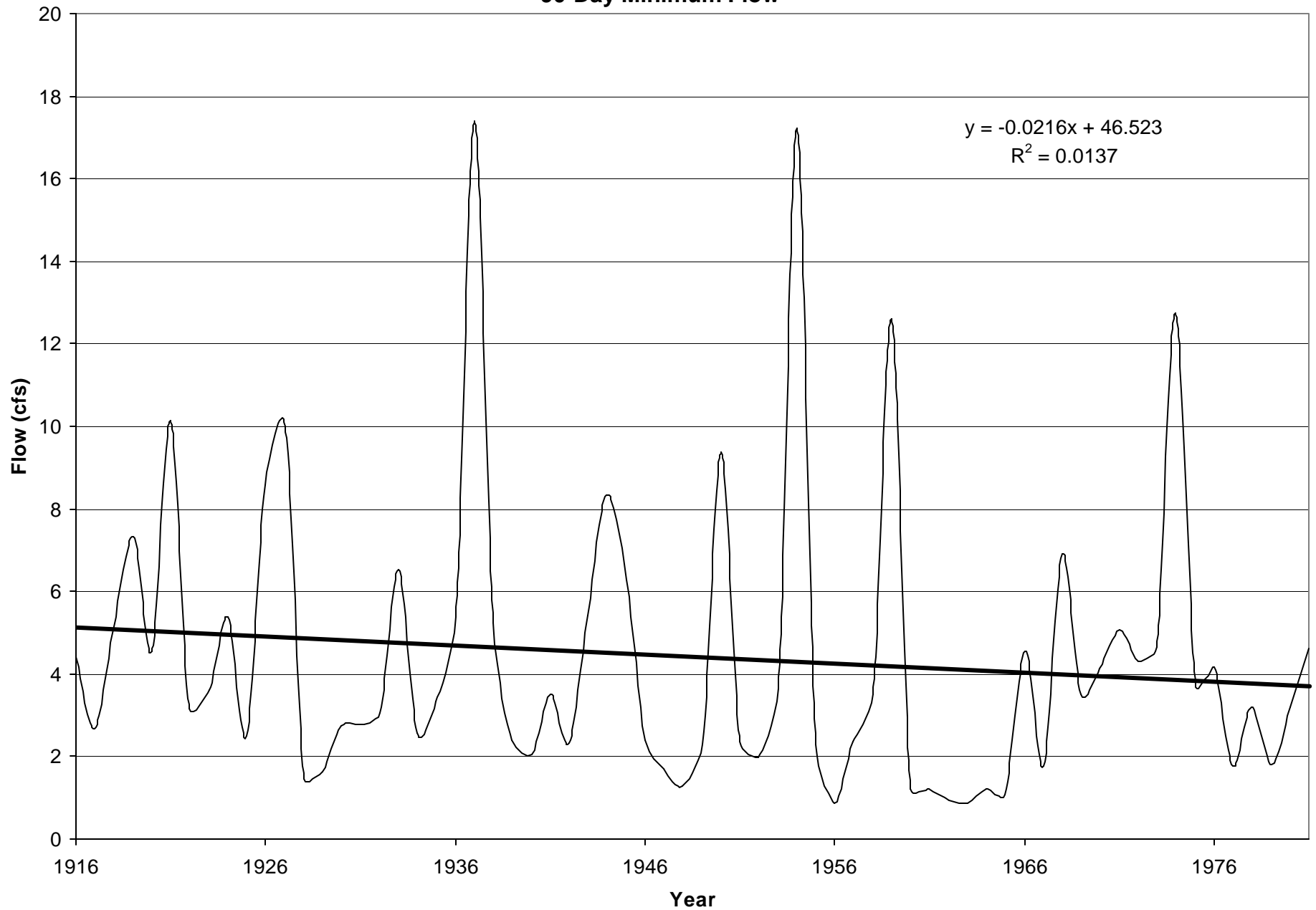
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**7-Day Minimum Flow**



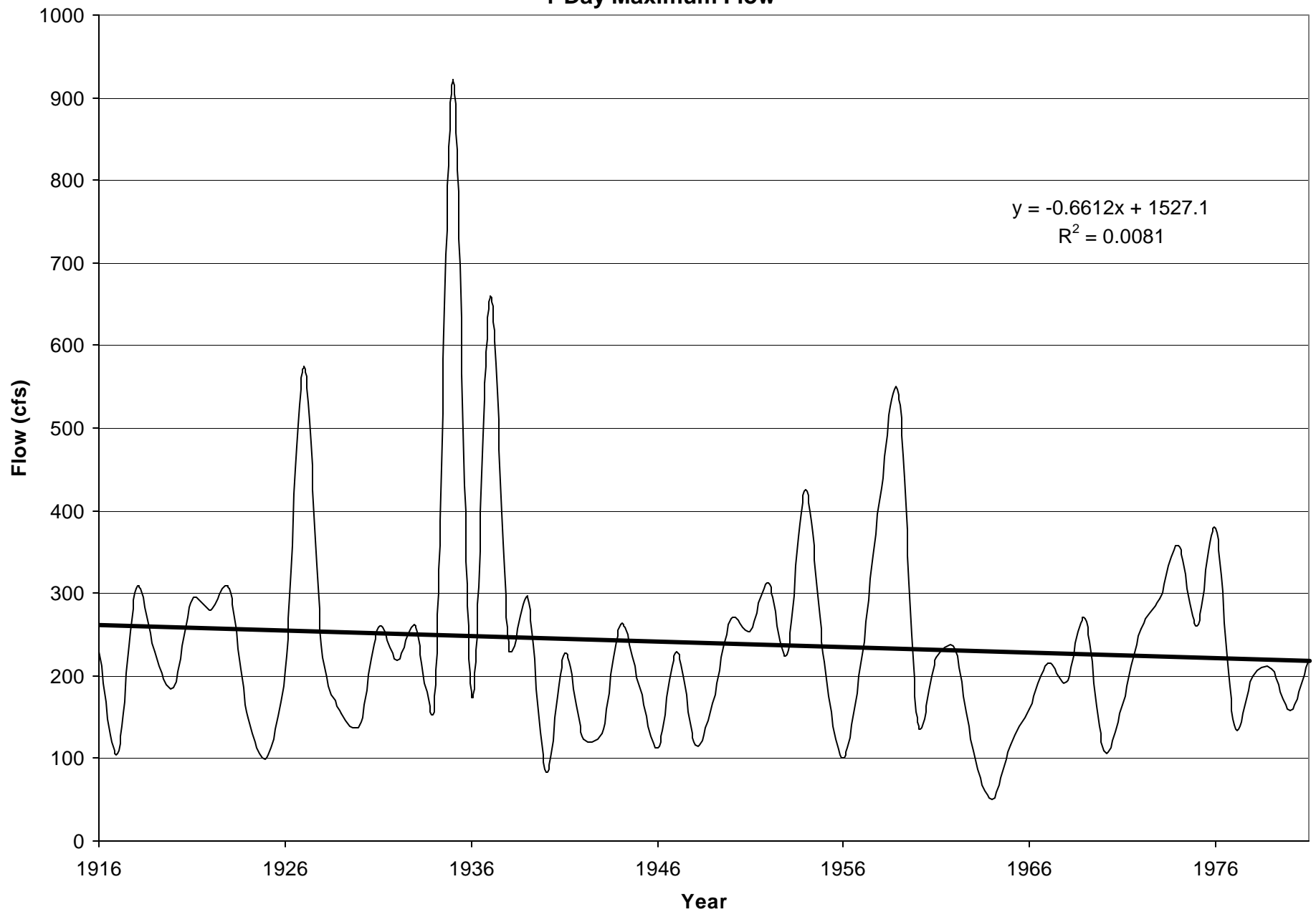
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**30-Day Minimum Flow**



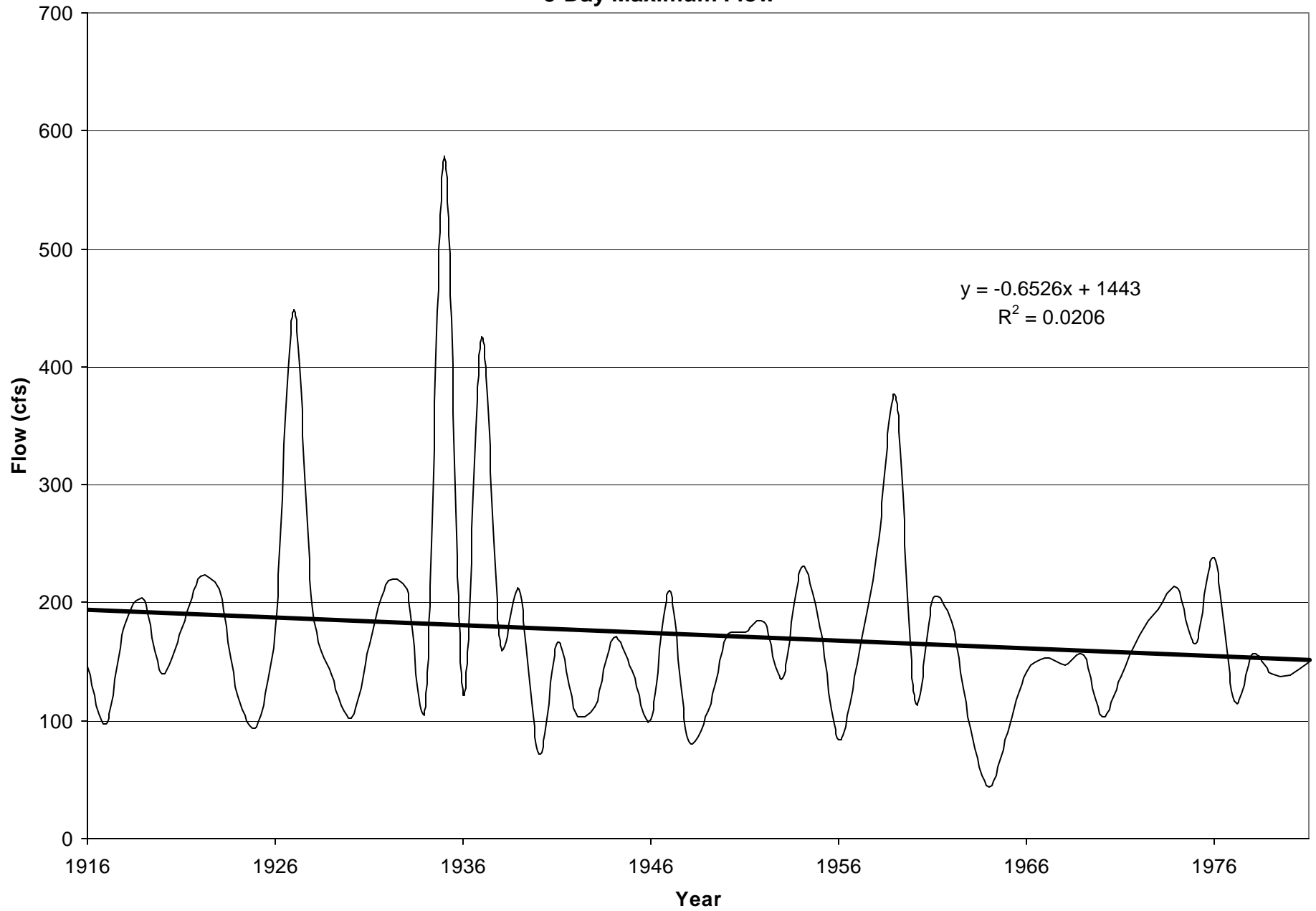
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**90-Day Minimum Flow**



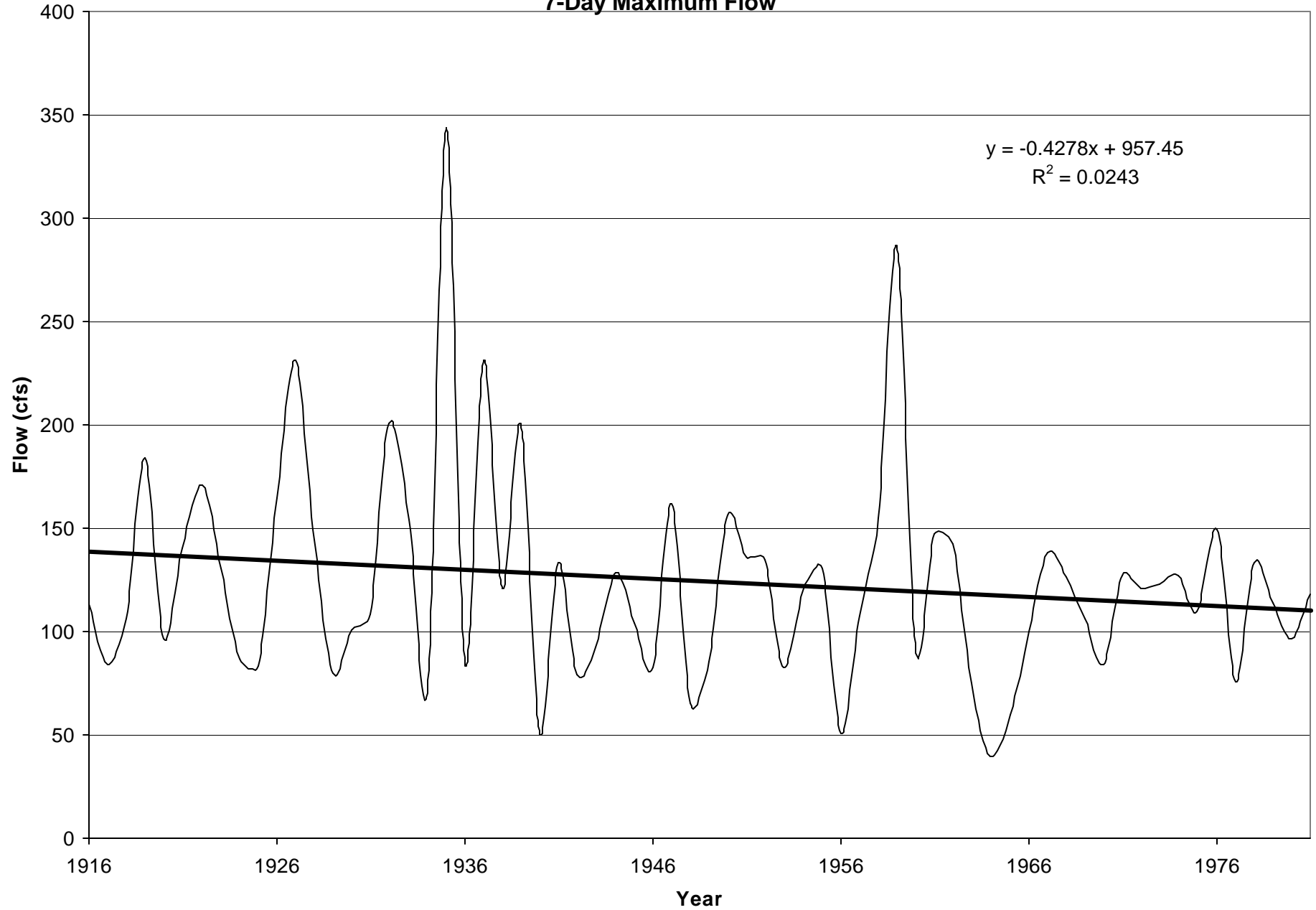
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**1-Day Maximum Flow**



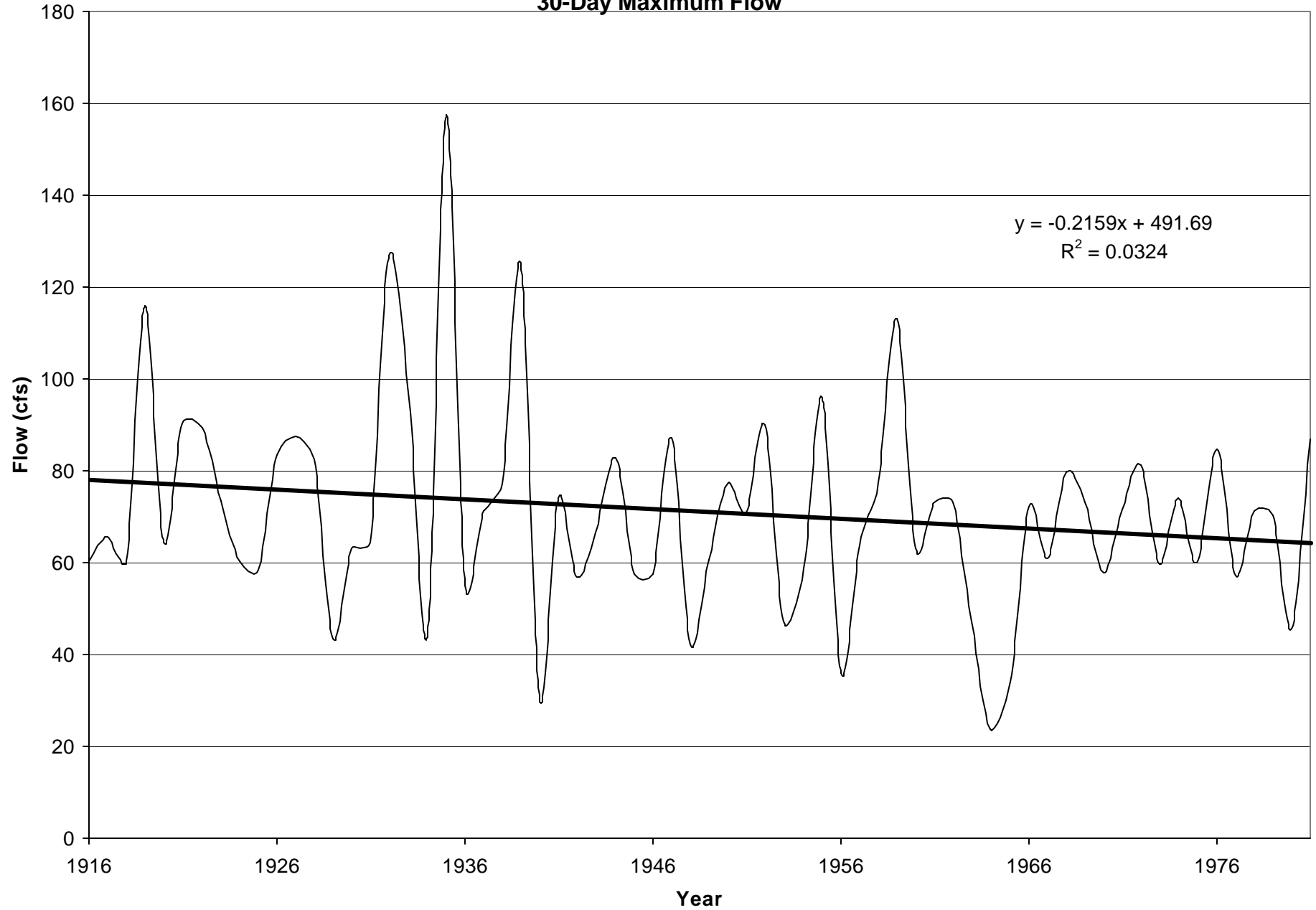
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**3-Day Maximum Flow**



**Priest Brook near Winchendon, MA, Drainage Area=19.4 sq mi**  
**7-Day Maximum Flow**

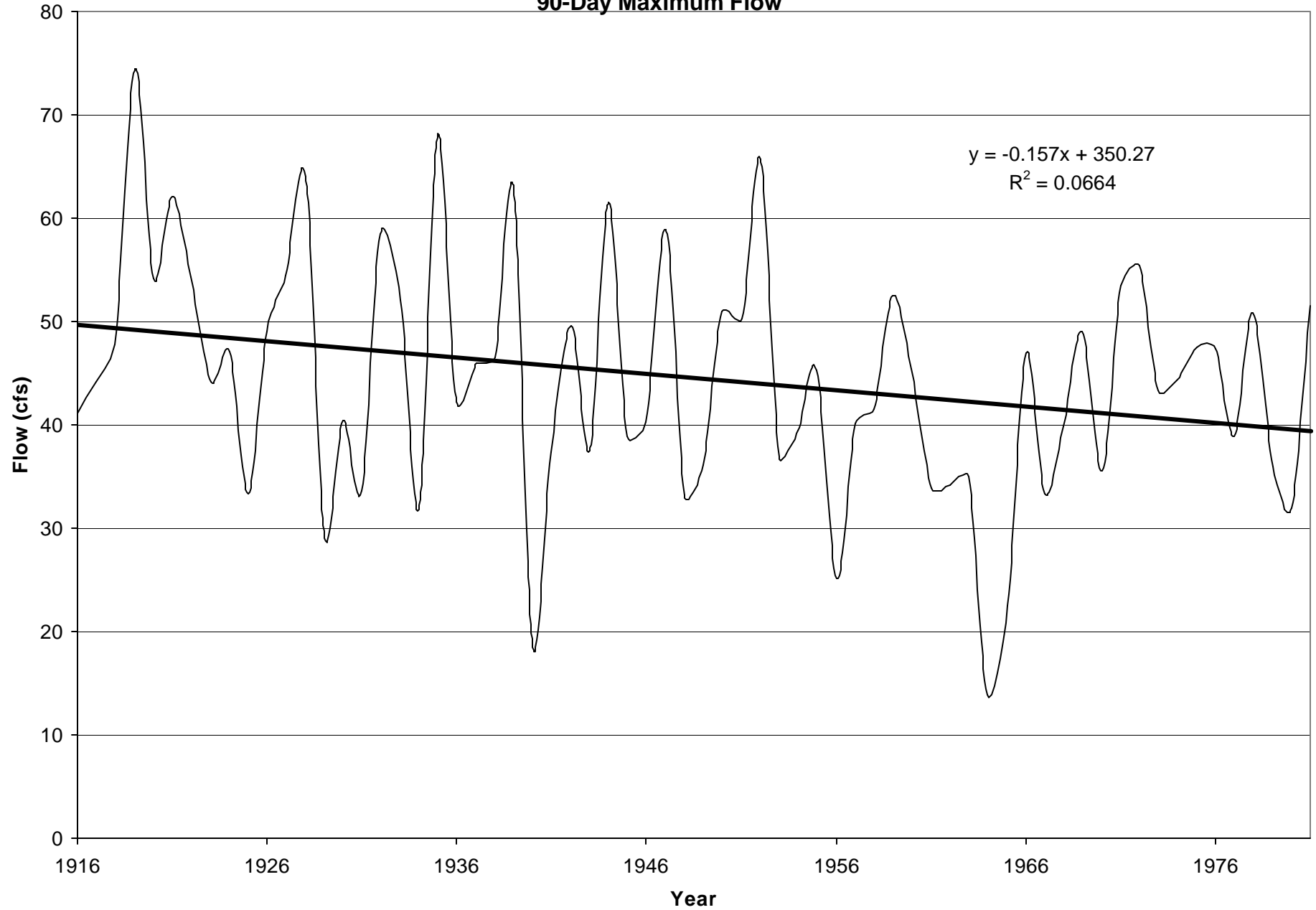


**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**30-Day Maximum Flow**

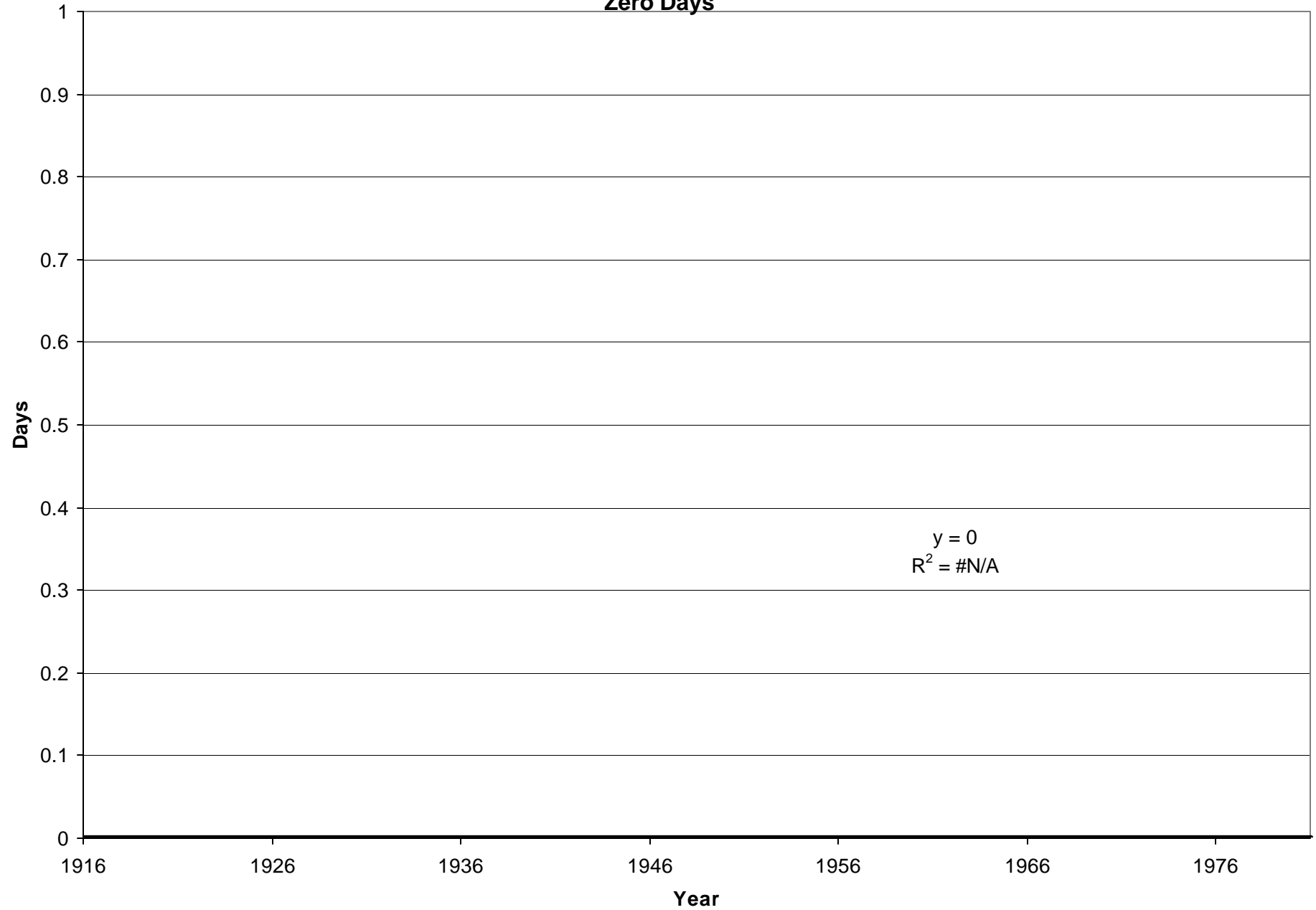




**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**90-Day Maximum Flow**

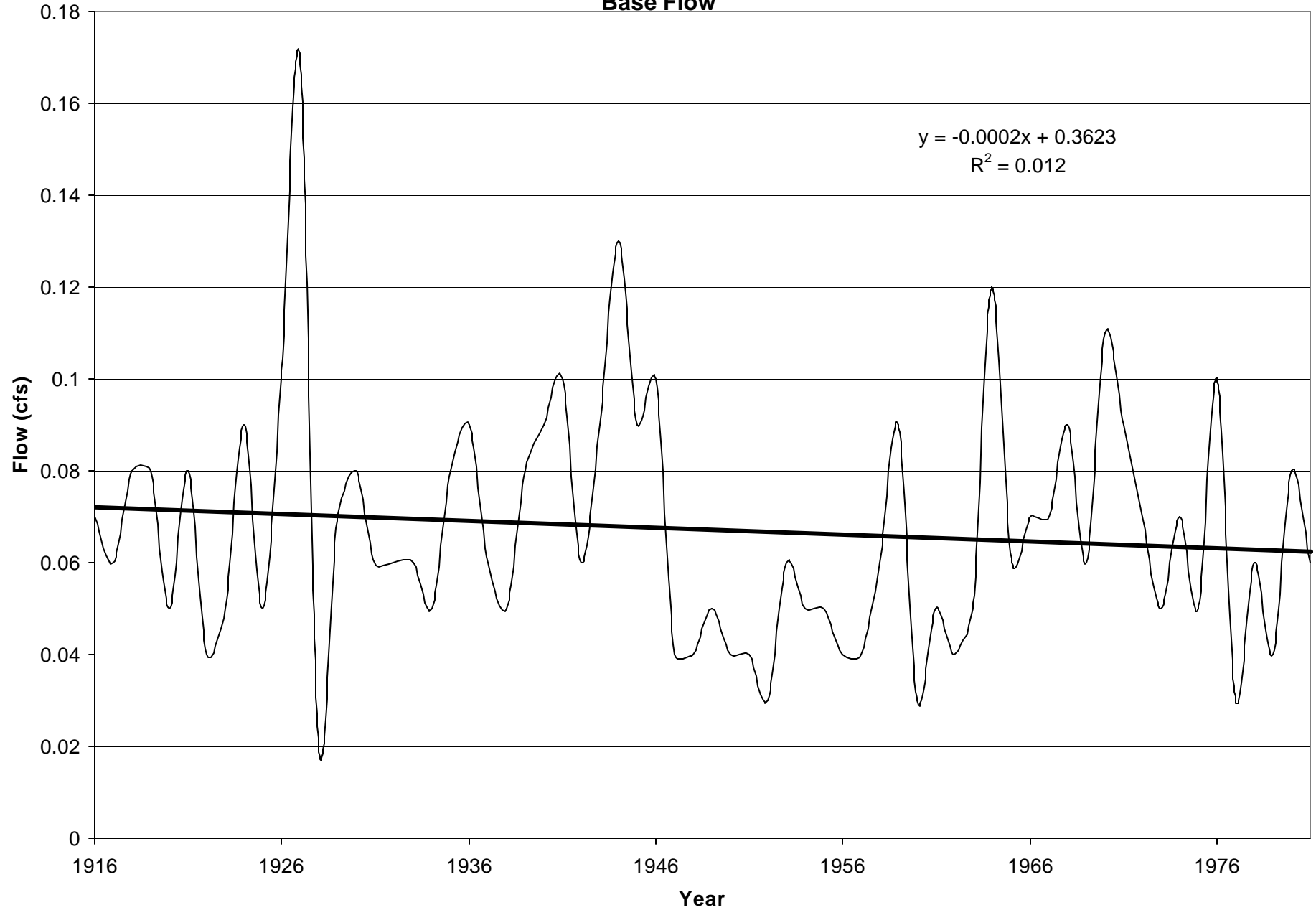


**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Zero Days**

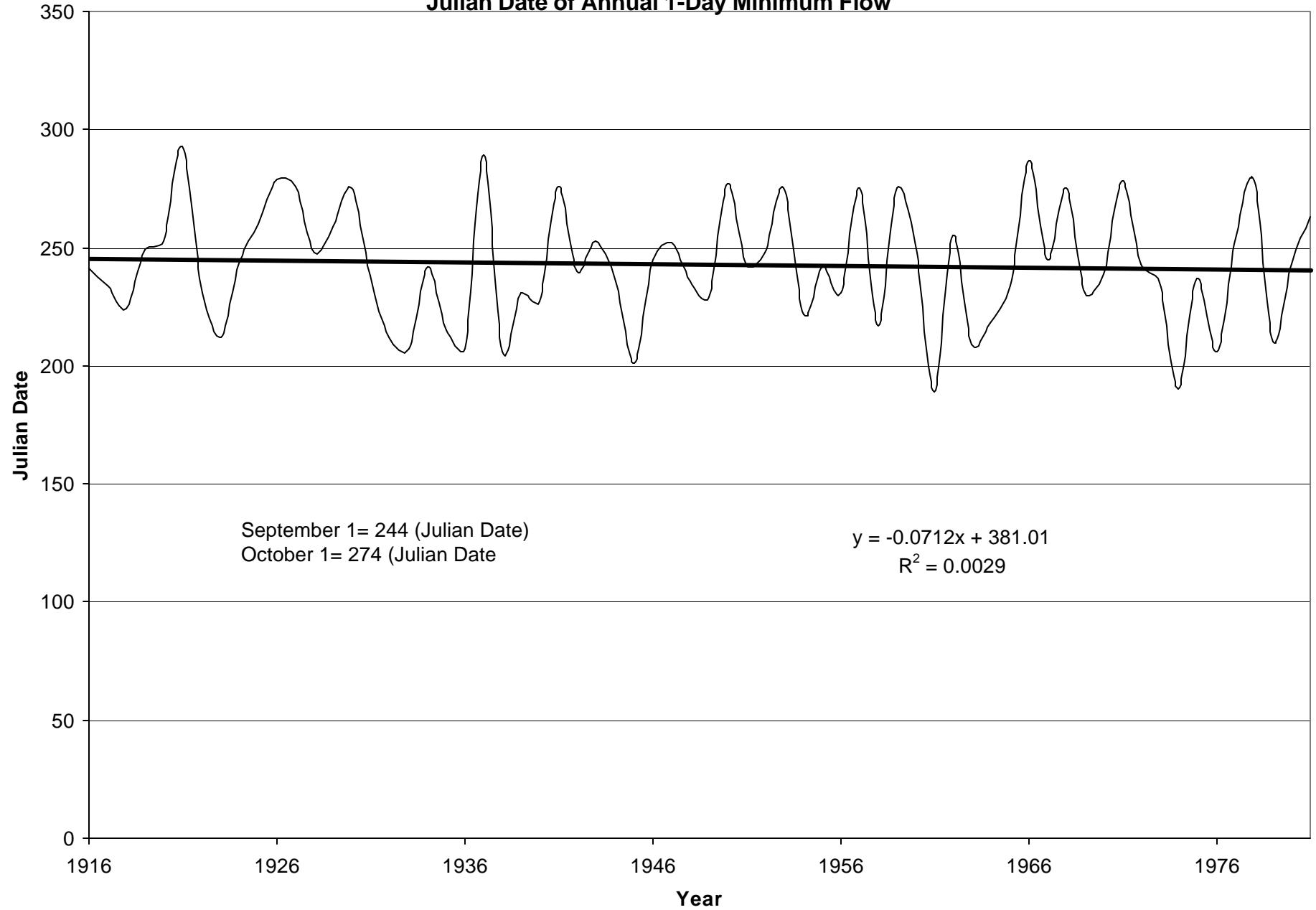


**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**

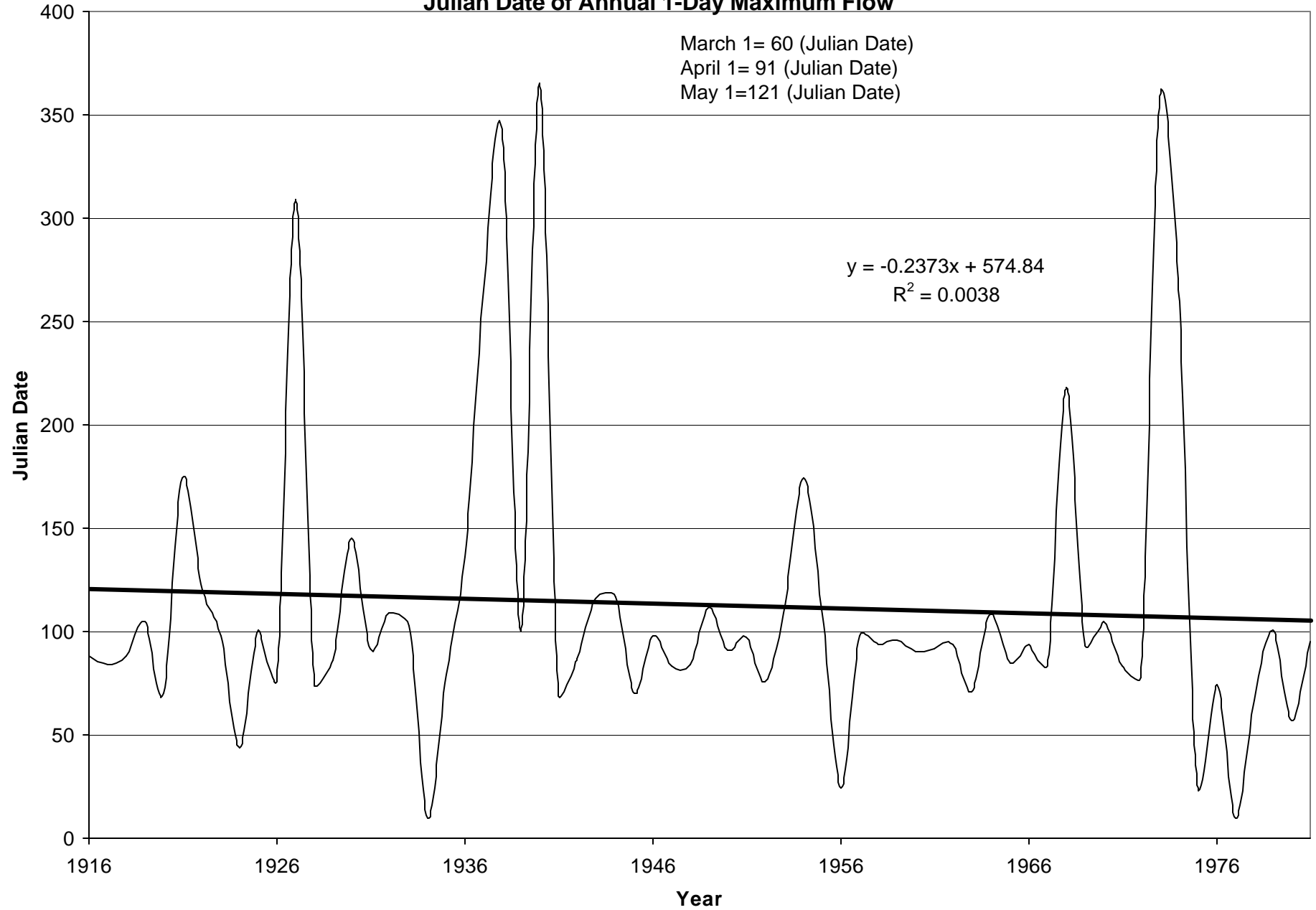
**Base Flow**



**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Julian Date of Annual 1-Day Minimum Flow**

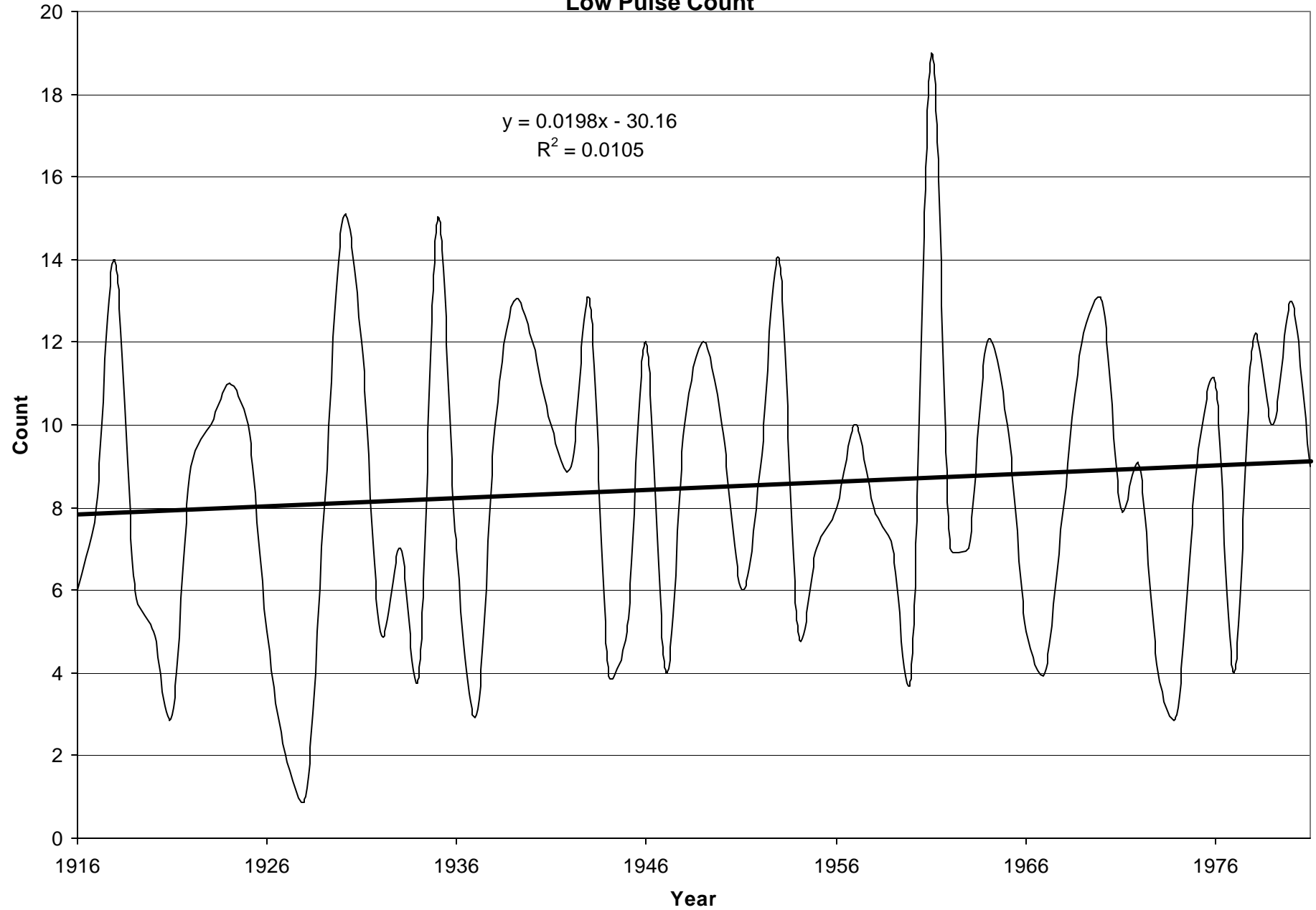


**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Julian Date of Annual 1-Day Maximum Flow**

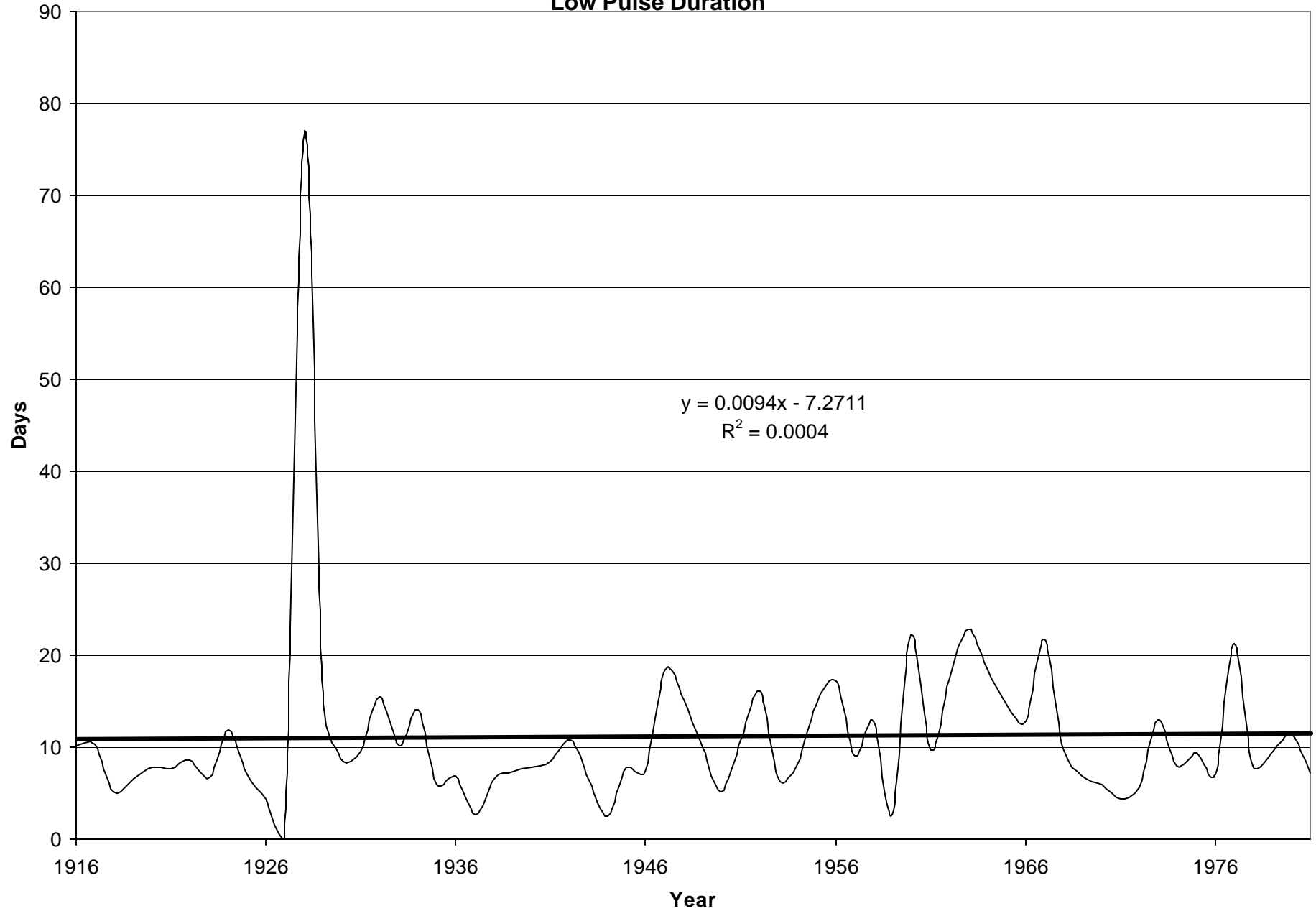


**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**

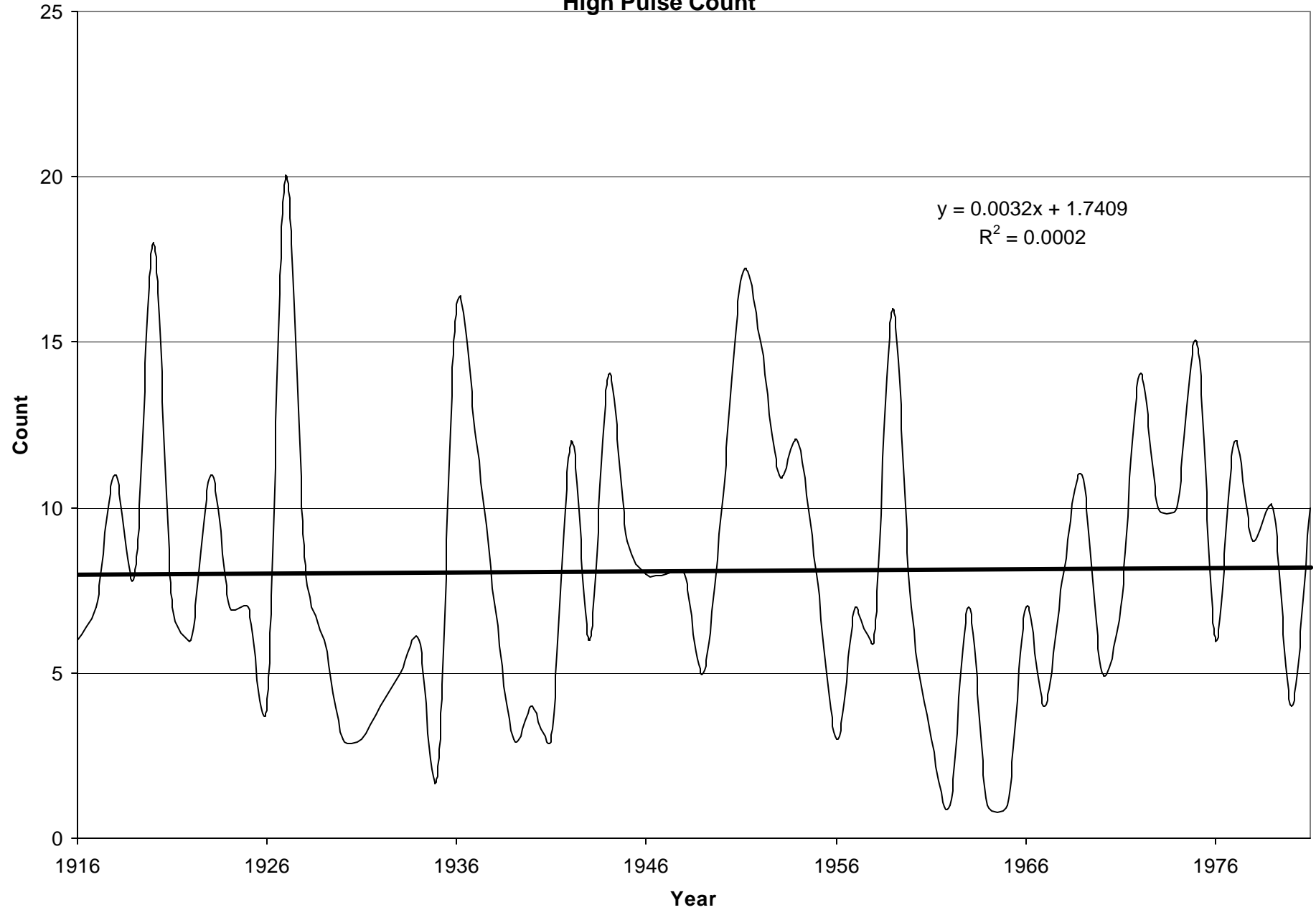
**Low Pulse Count**



**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Low Pulse Duration**

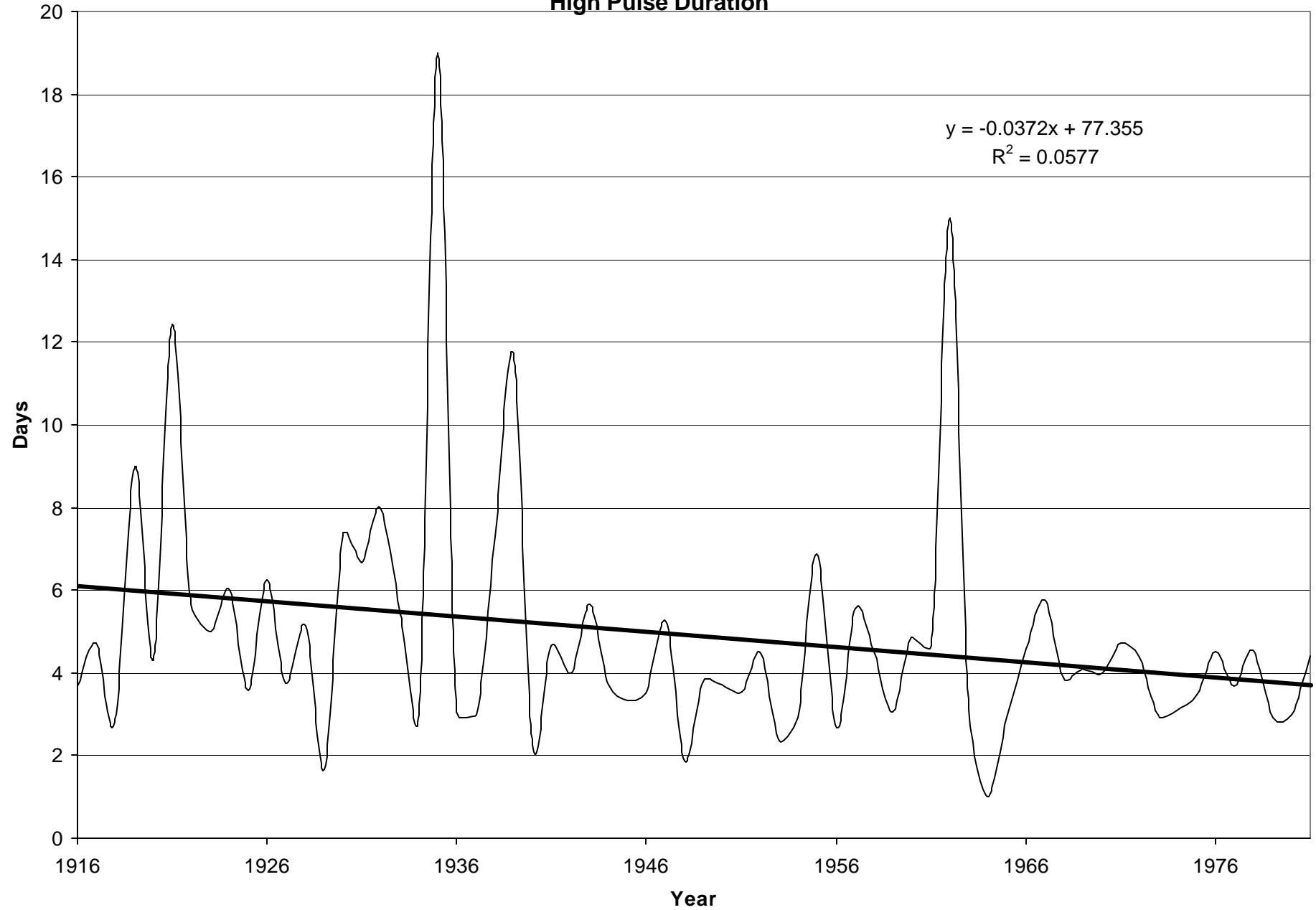


**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**High Pulse Count**

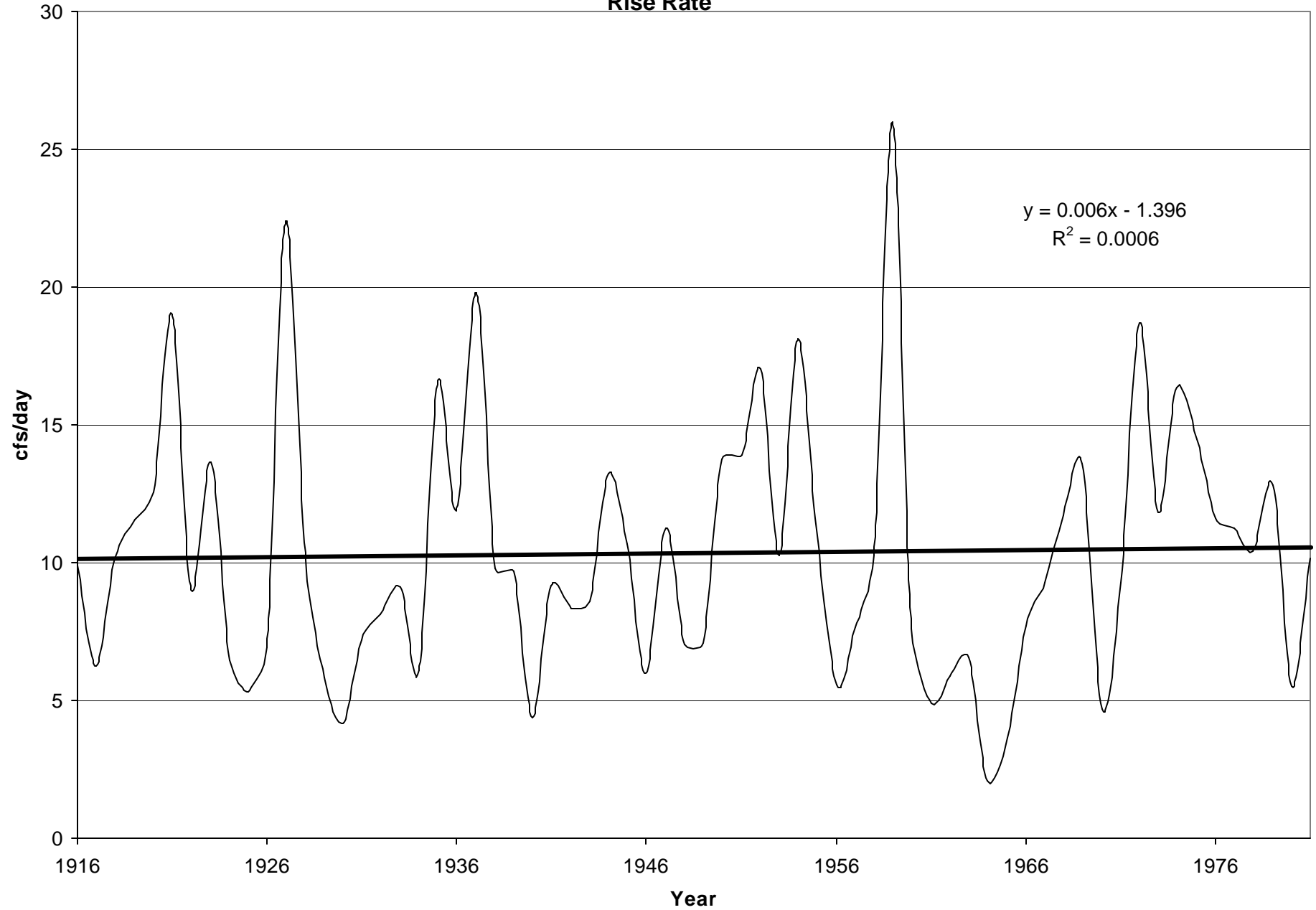




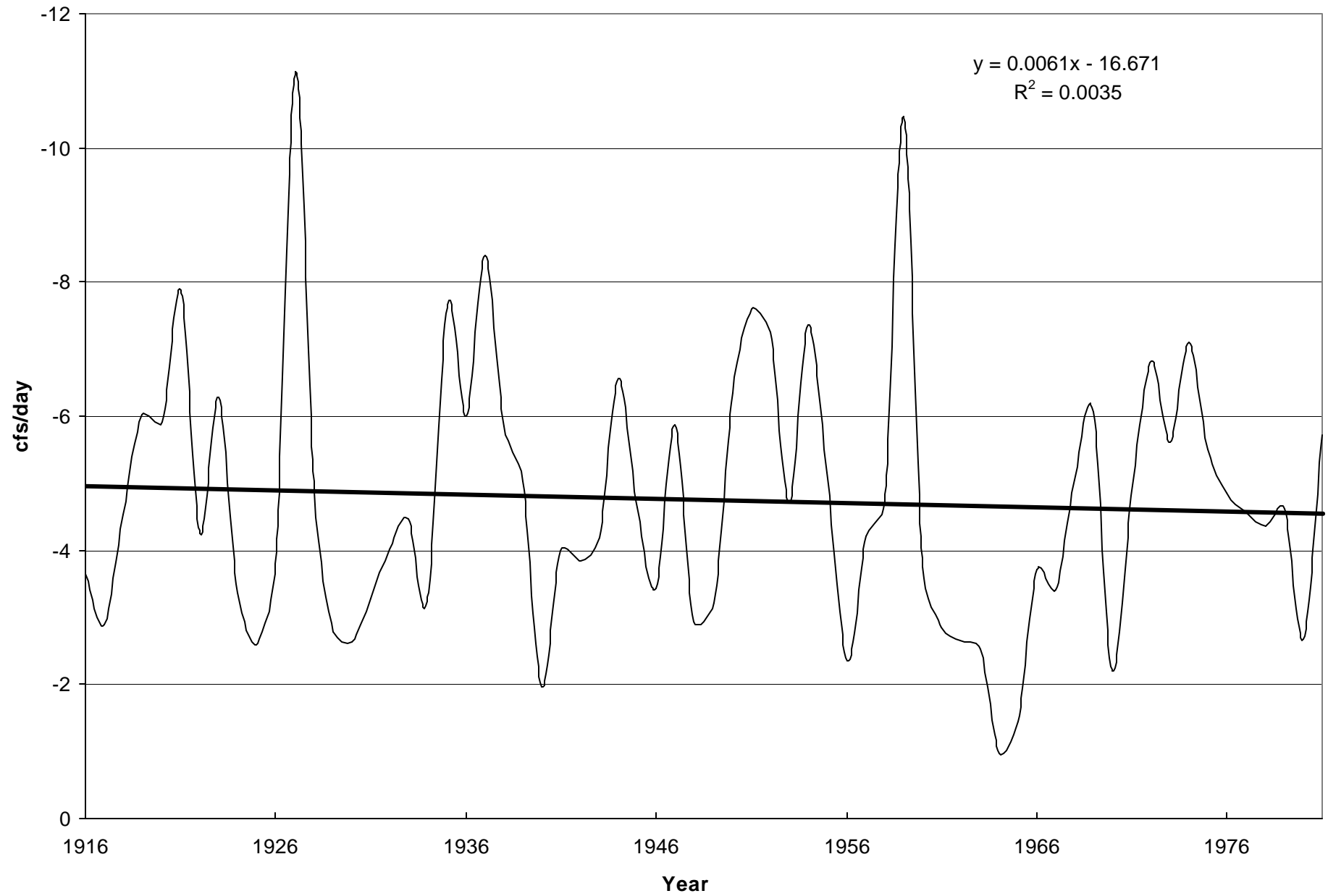
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**High Pulse Duration**



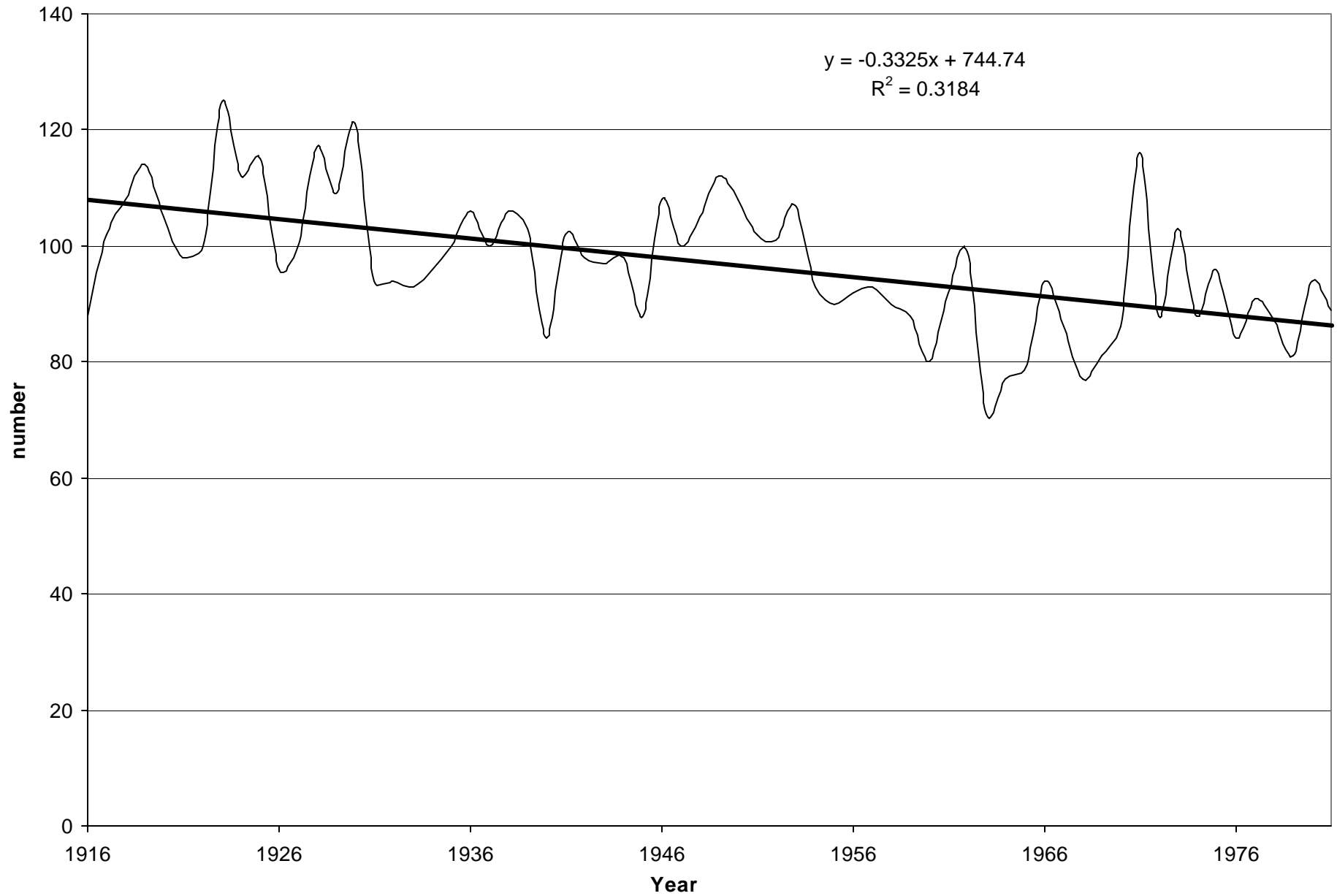
**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Rise Rate**



**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Fall Rate**



**Moss Brook at Wendell Depot, MA, Drainage Area=12.1 sq mi**  
**Reversals**

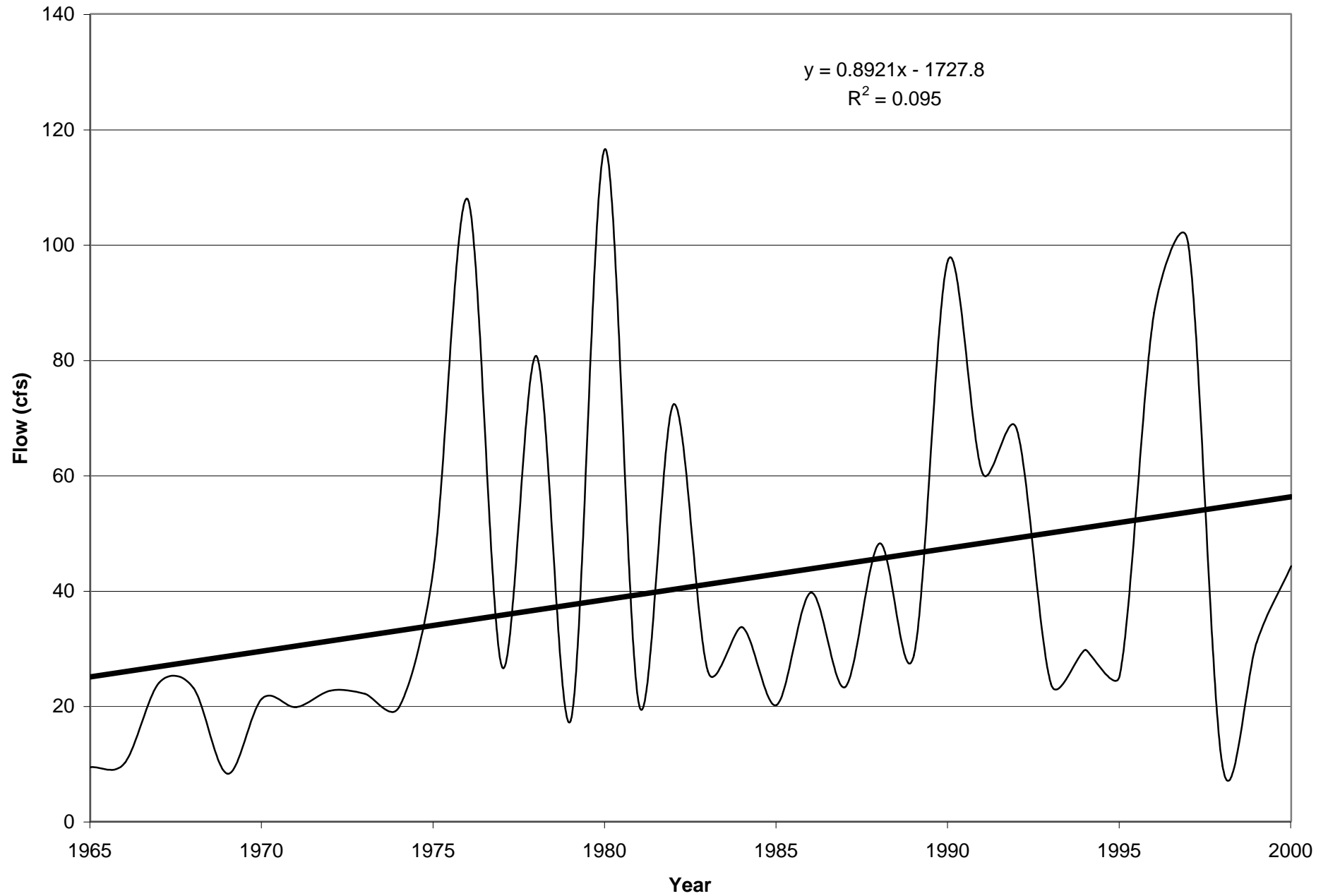


**Otter River at Otter River, MA**  
**Drainage Area= 34.1 square miles**  
**Period of Record: Water Years 1965-2000**  
***IHA Results***

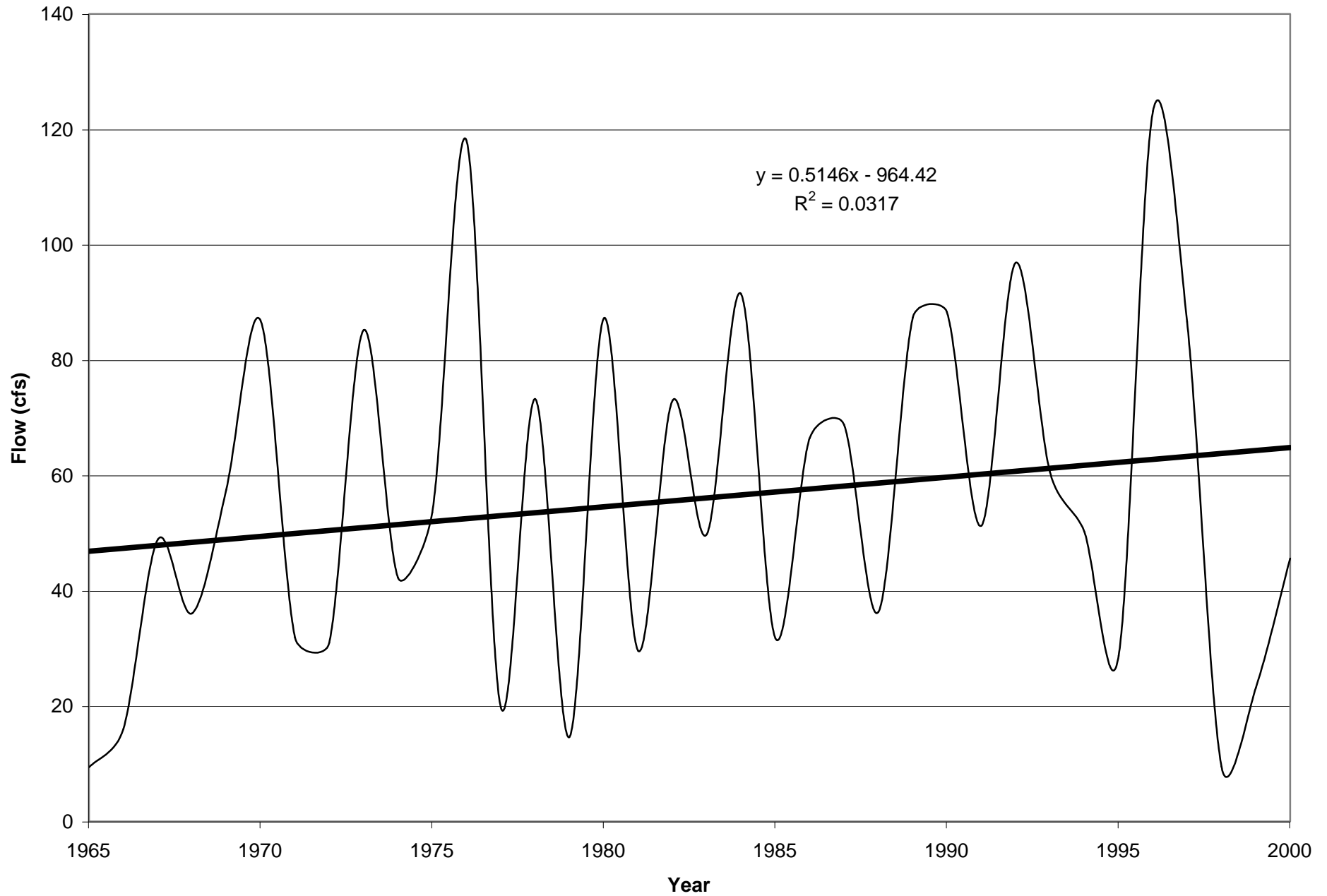
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1. Average Monthly Flow for October
2. Average Monthly Flow for November
3. Average Monthly Flow for December
4. Average Monthly Flow for January
5. Average Monthly Flow for February
6. Average Monthly Flow for March
7. Average Monthly Flow for April
8. Average Monthly Flow for May
9. Average Monthly Flow for June
10. Average Monthly Flow for July
11. Average Monthly Flow for August
12. Average Monthly Flow for September
13. 1-Day Minimum Flow
14. 3-Day Minimum Flow
15. 7-Day Minimum Flow
16. 30-Day Minimum Flow
17. 90-Day Minimum Flow
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19. 3-Day Maximum Flow
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22. 90-Day Maximum Flow
23. Zero Days
24. Base Flow
25. Julian Date of Annual 1-Day Minimum Flow
26. Julian Date of Annual 1-Day Maximum Flow
27. Low Pulse Count
28. Low Pulse Duration
29. High Pulse Count
30. High Pulse Duration
31. Rise Rate
32. Fall Rate
33. Reversals

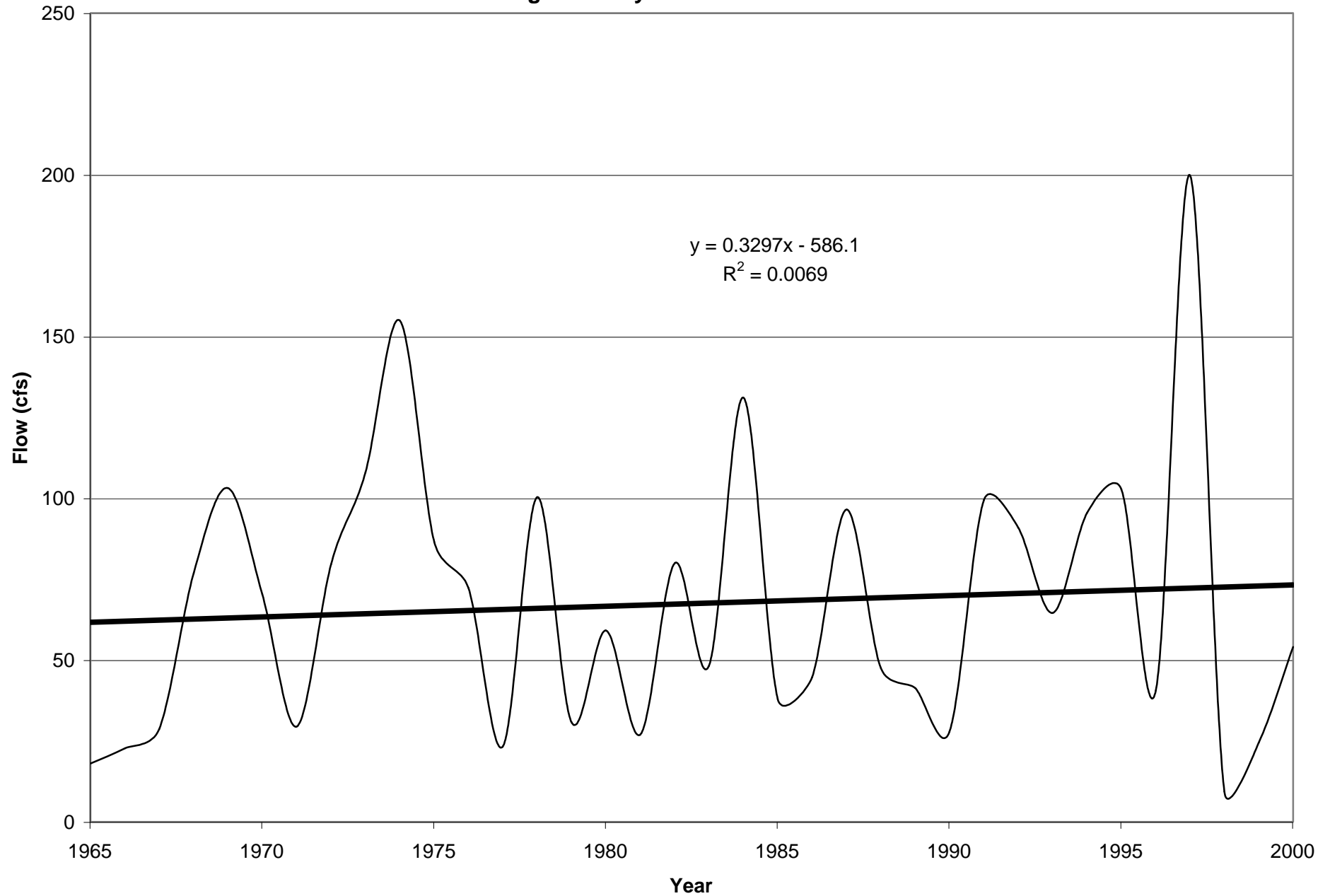
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for October**



**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for November**

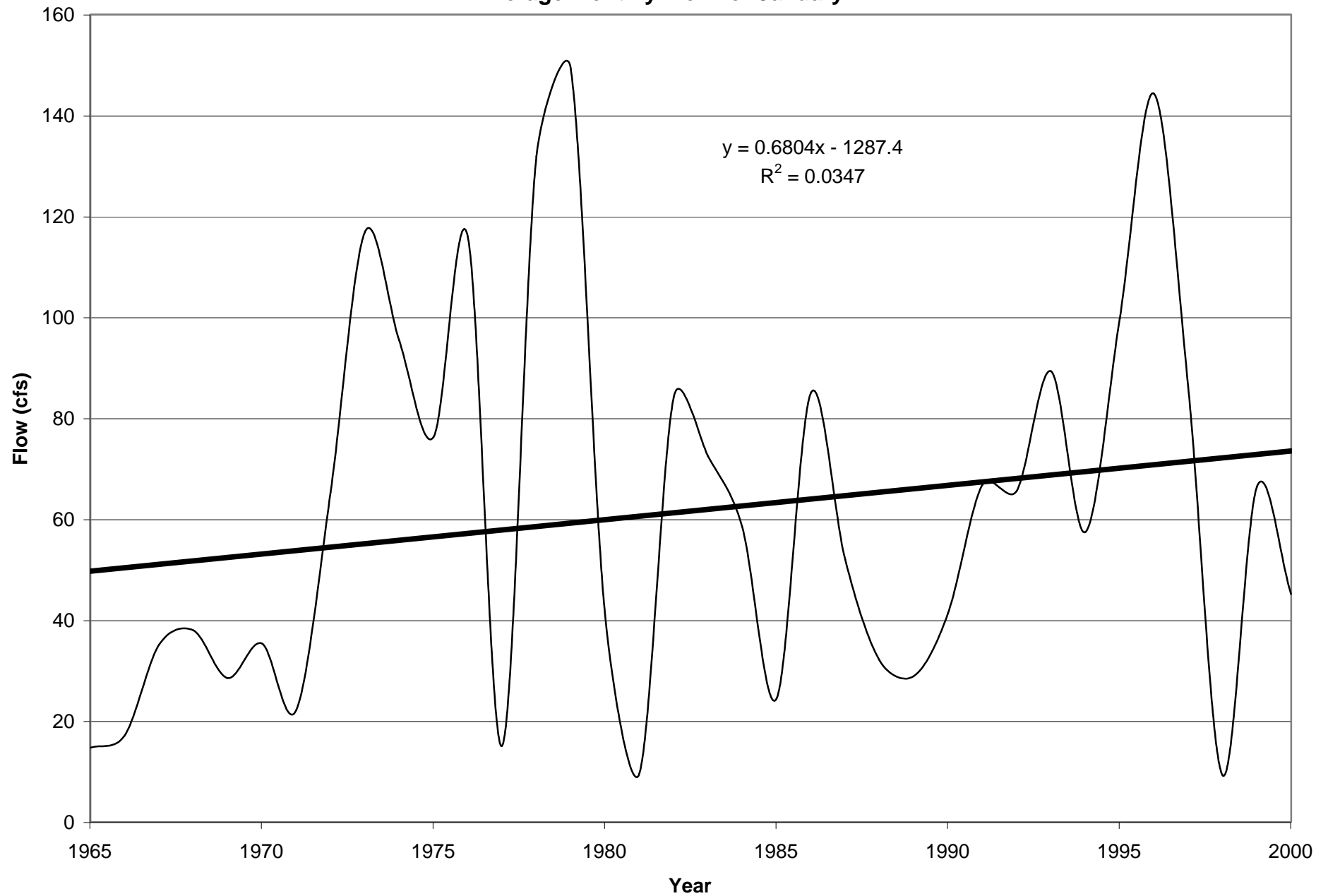


**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for December**

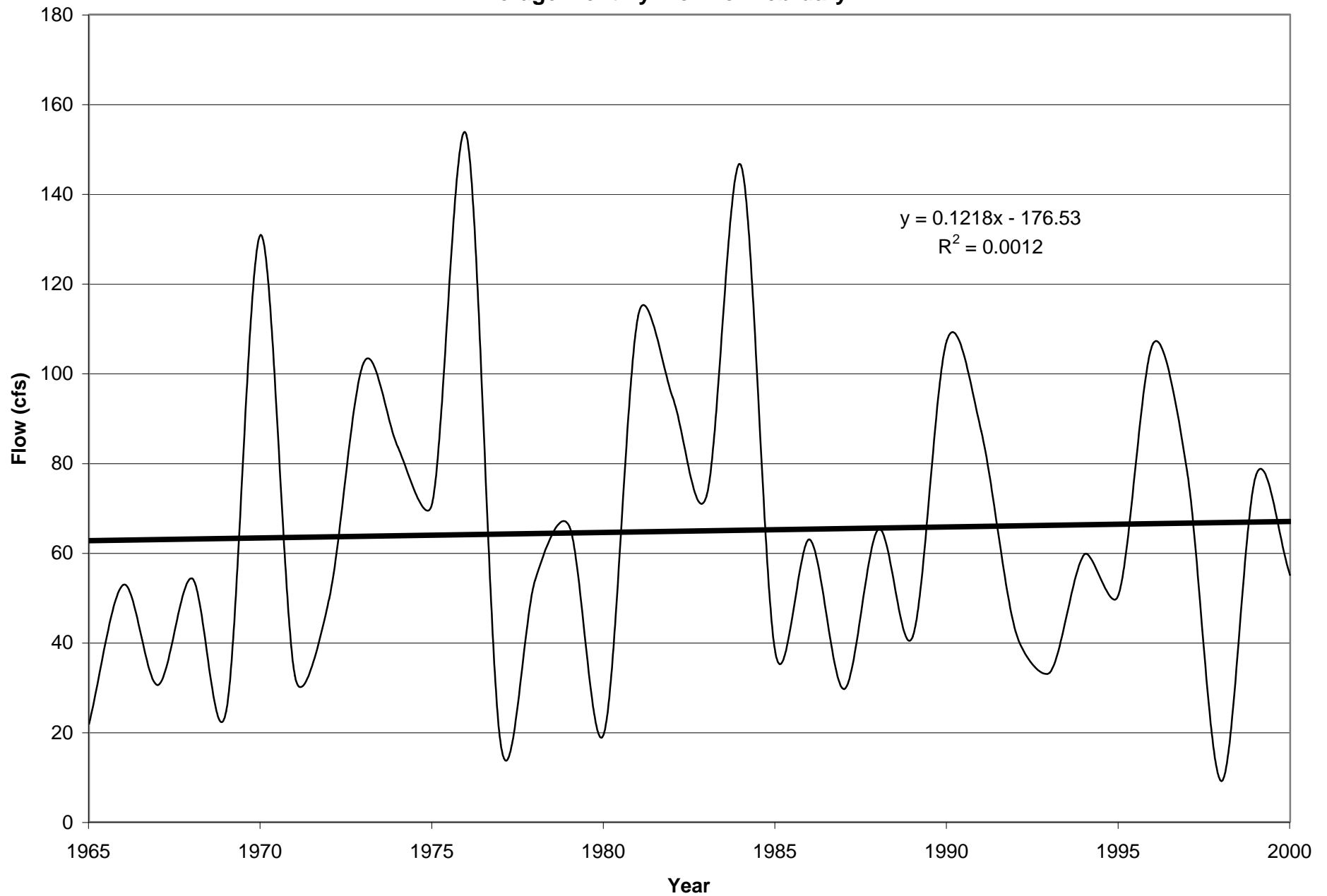




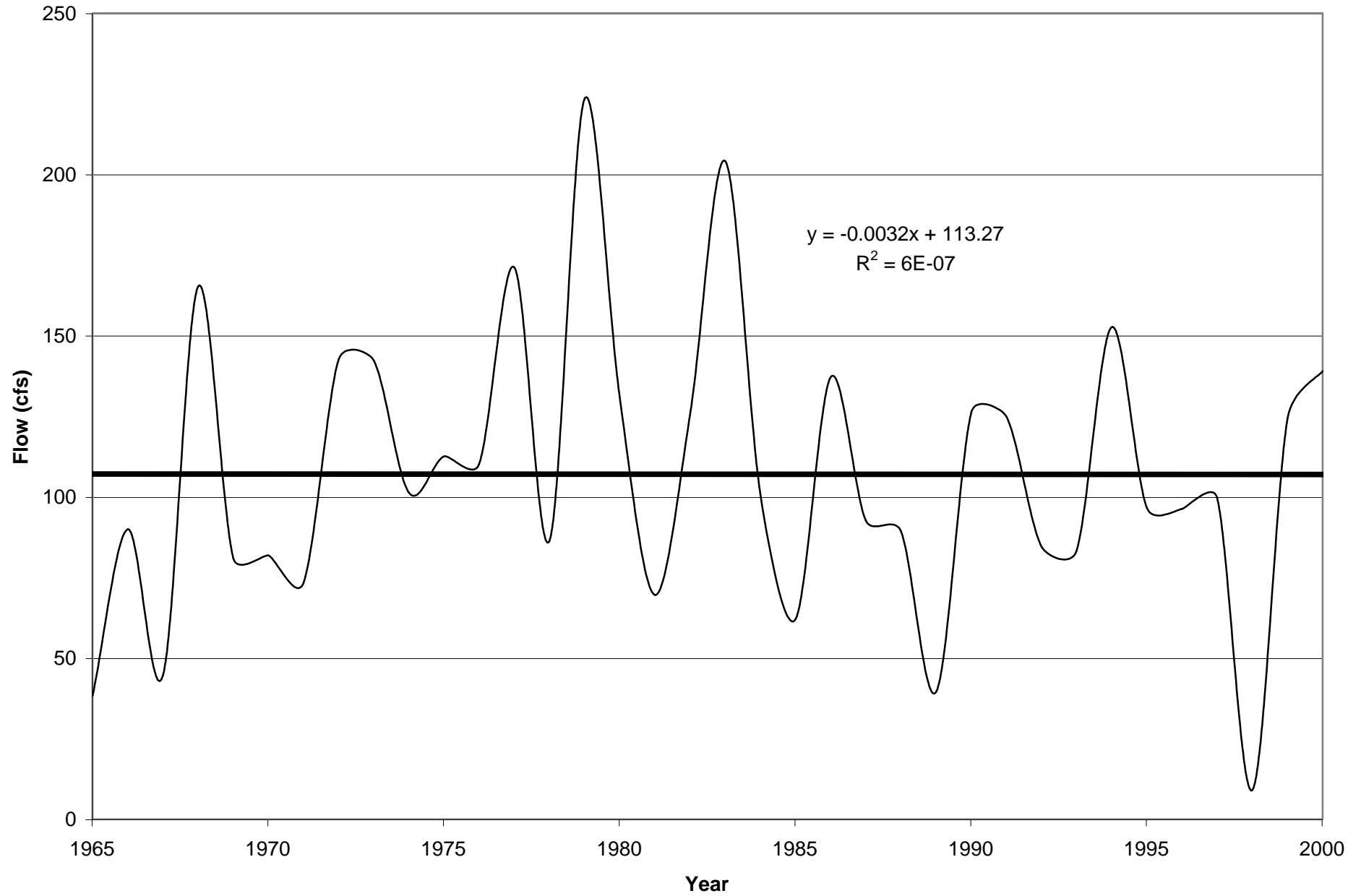
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for January**



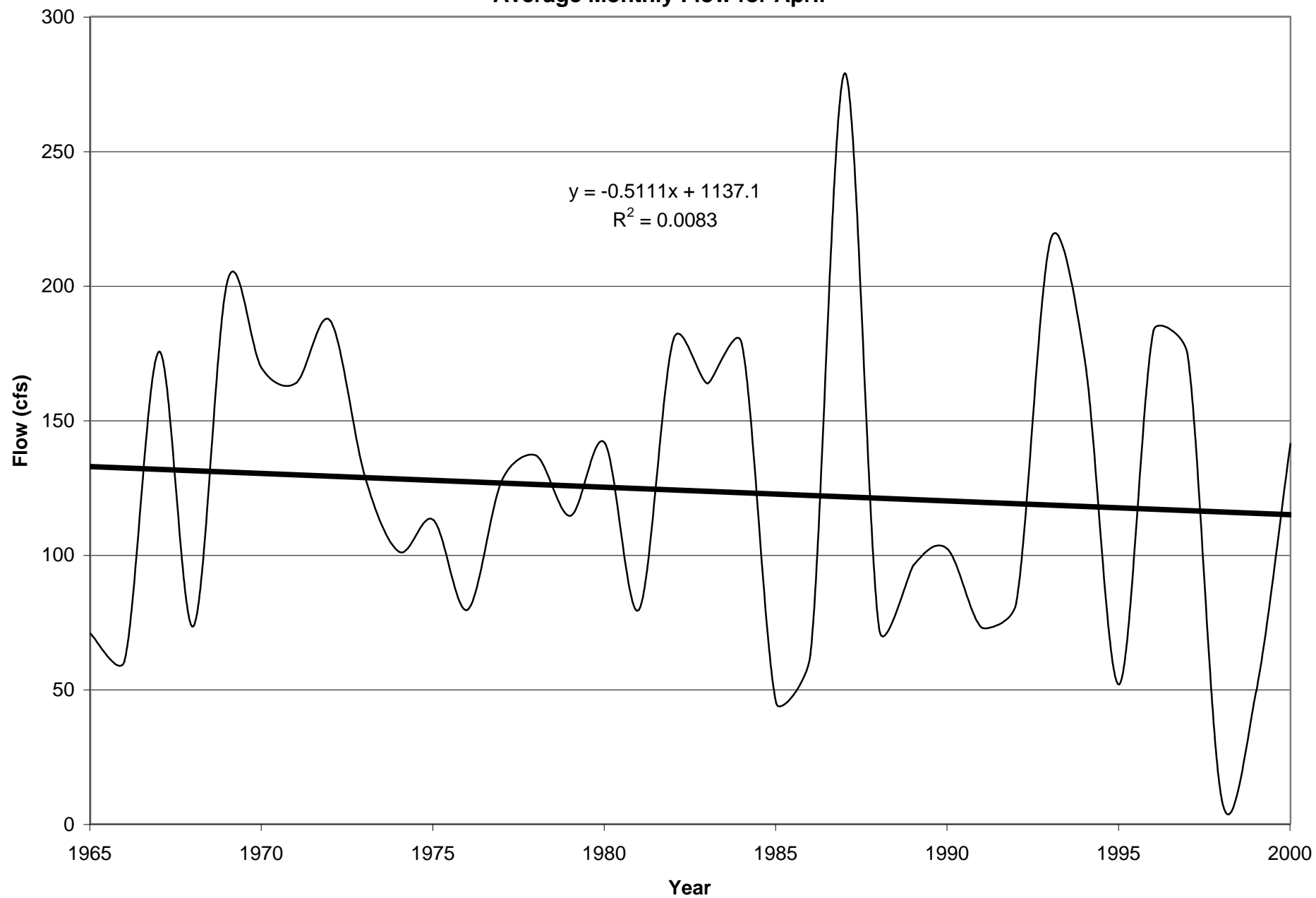
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for February**



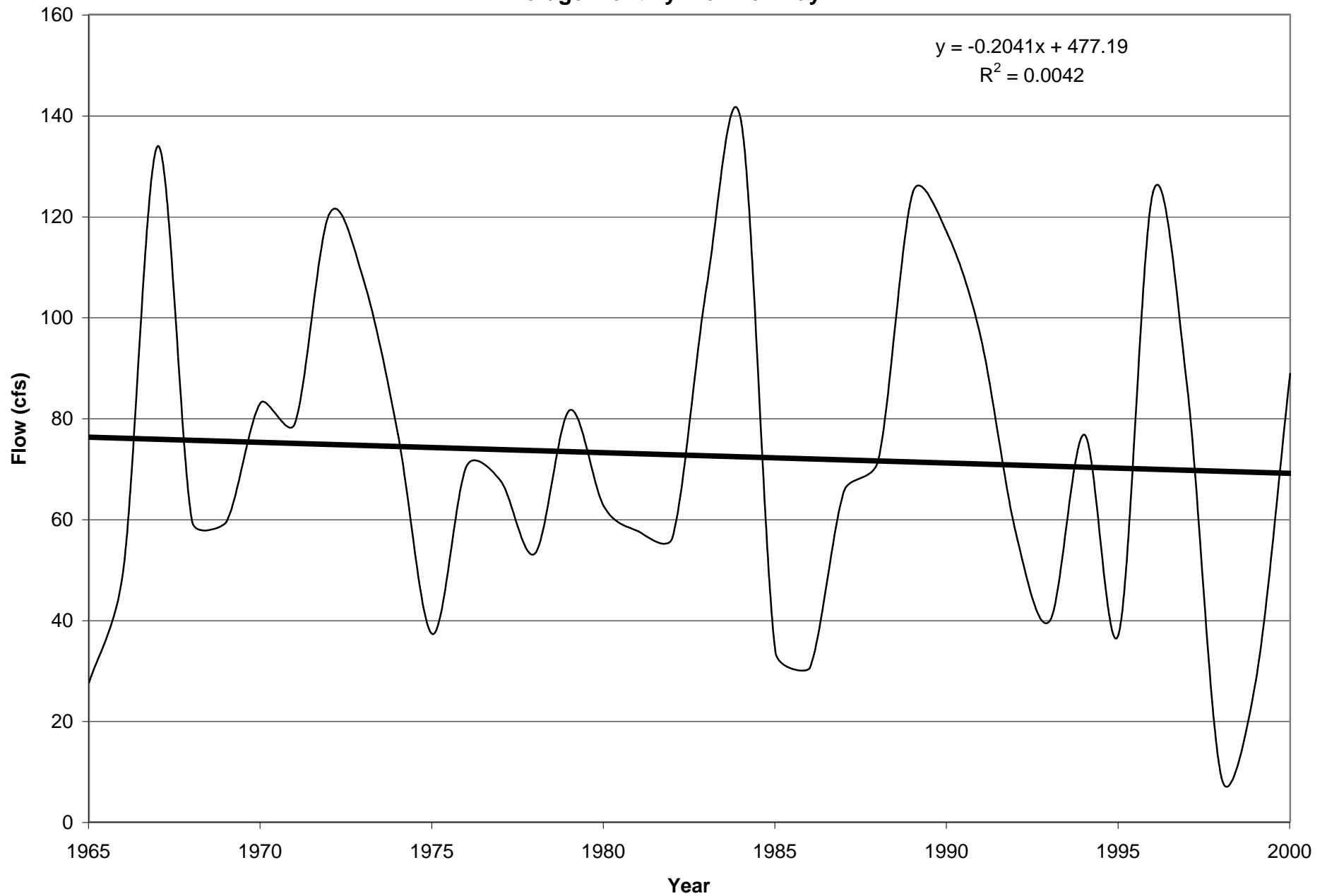
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for March**



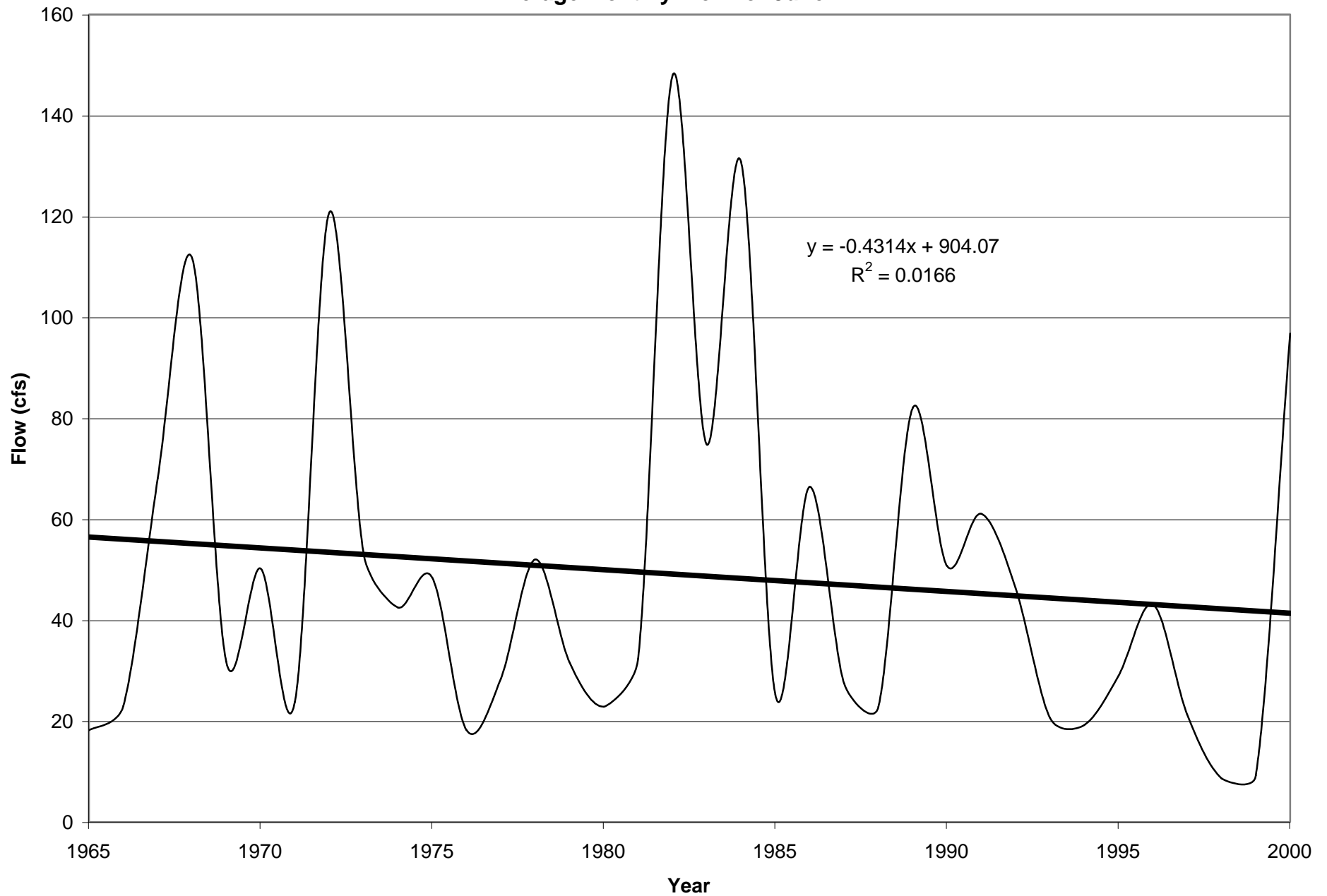
Otter River at Otter River, MA, Drainage Area=34.1 sq mi  
Average Monthly Flow for April



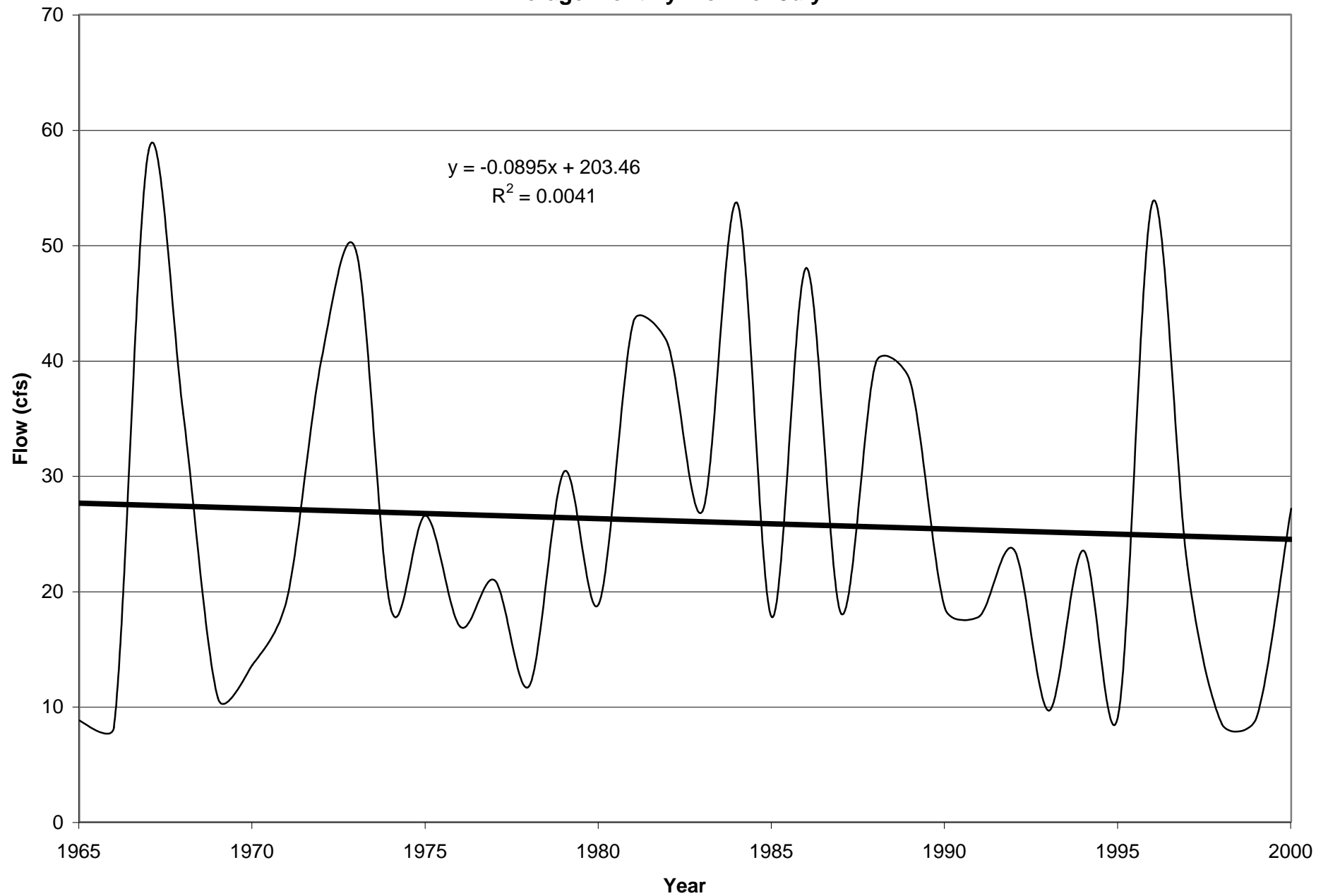
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for May**



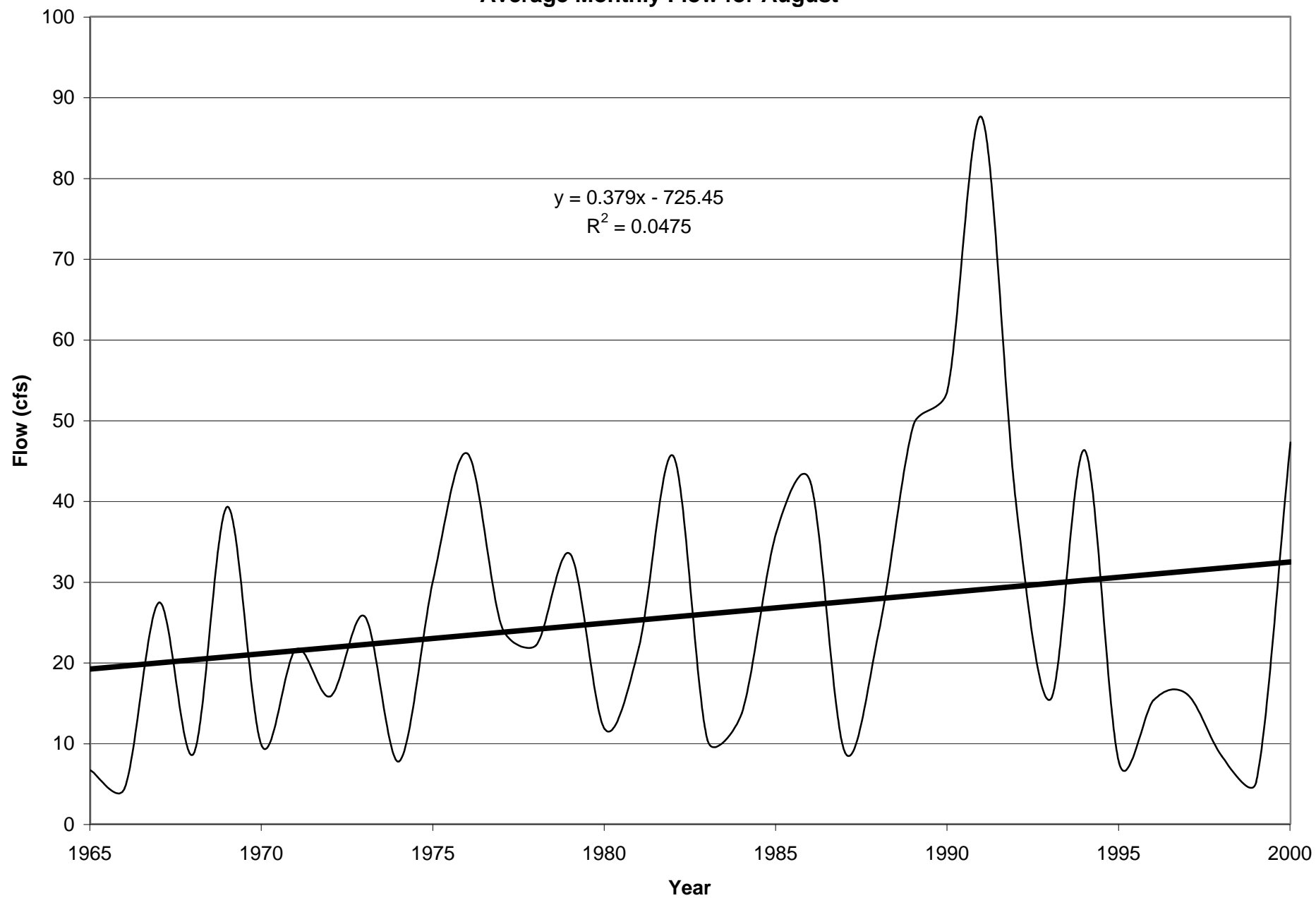
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for June**



**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for July**

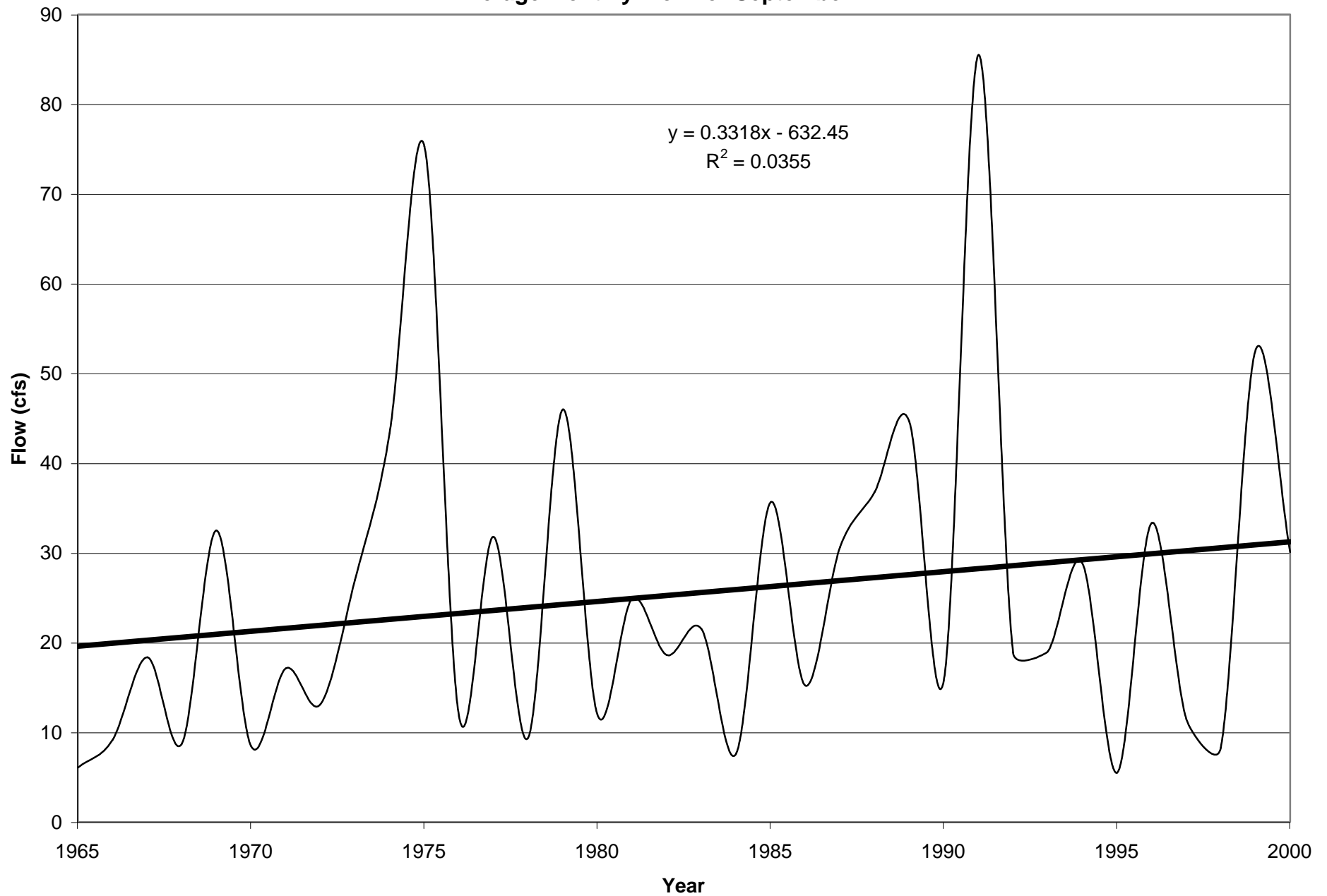


**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for August**

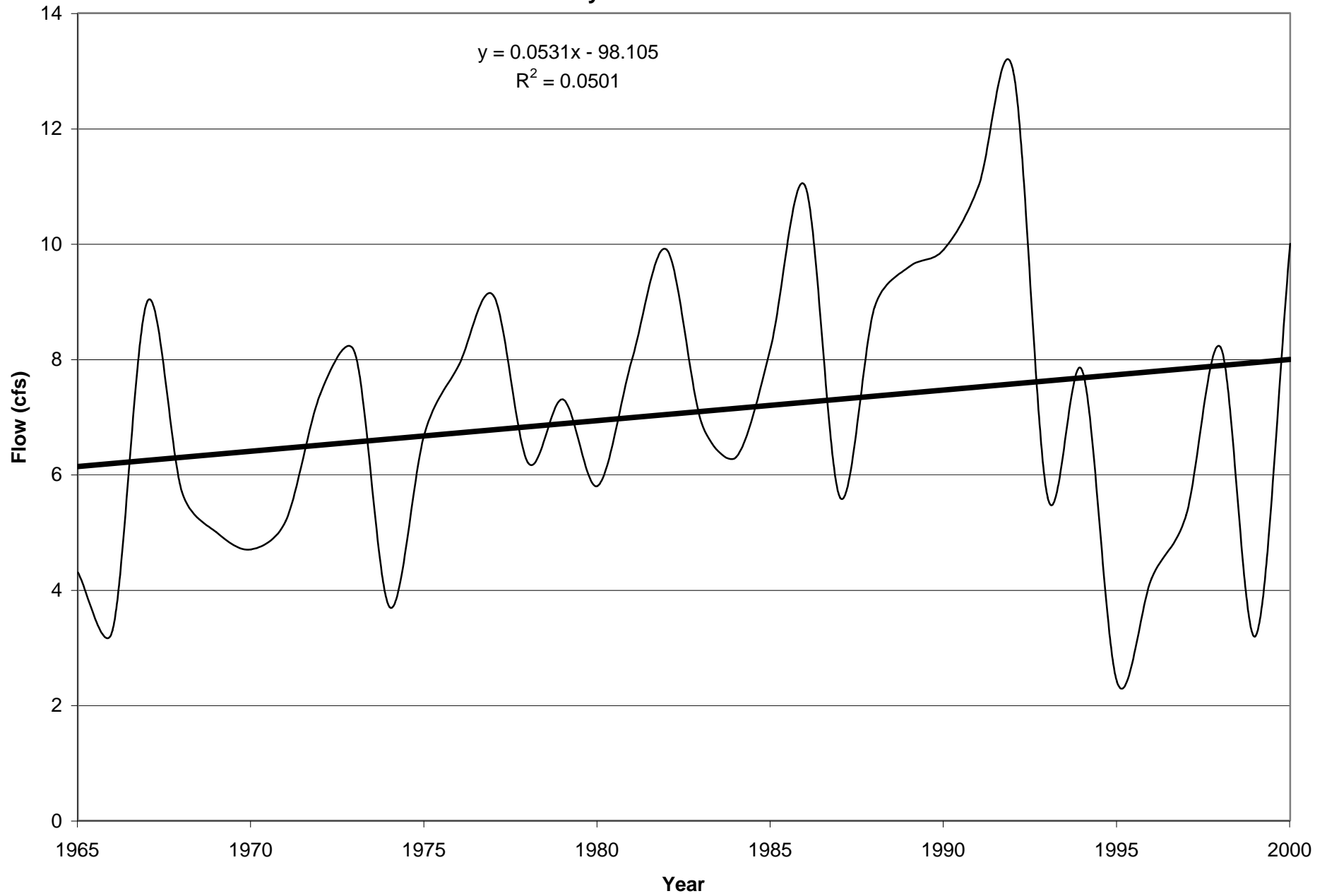




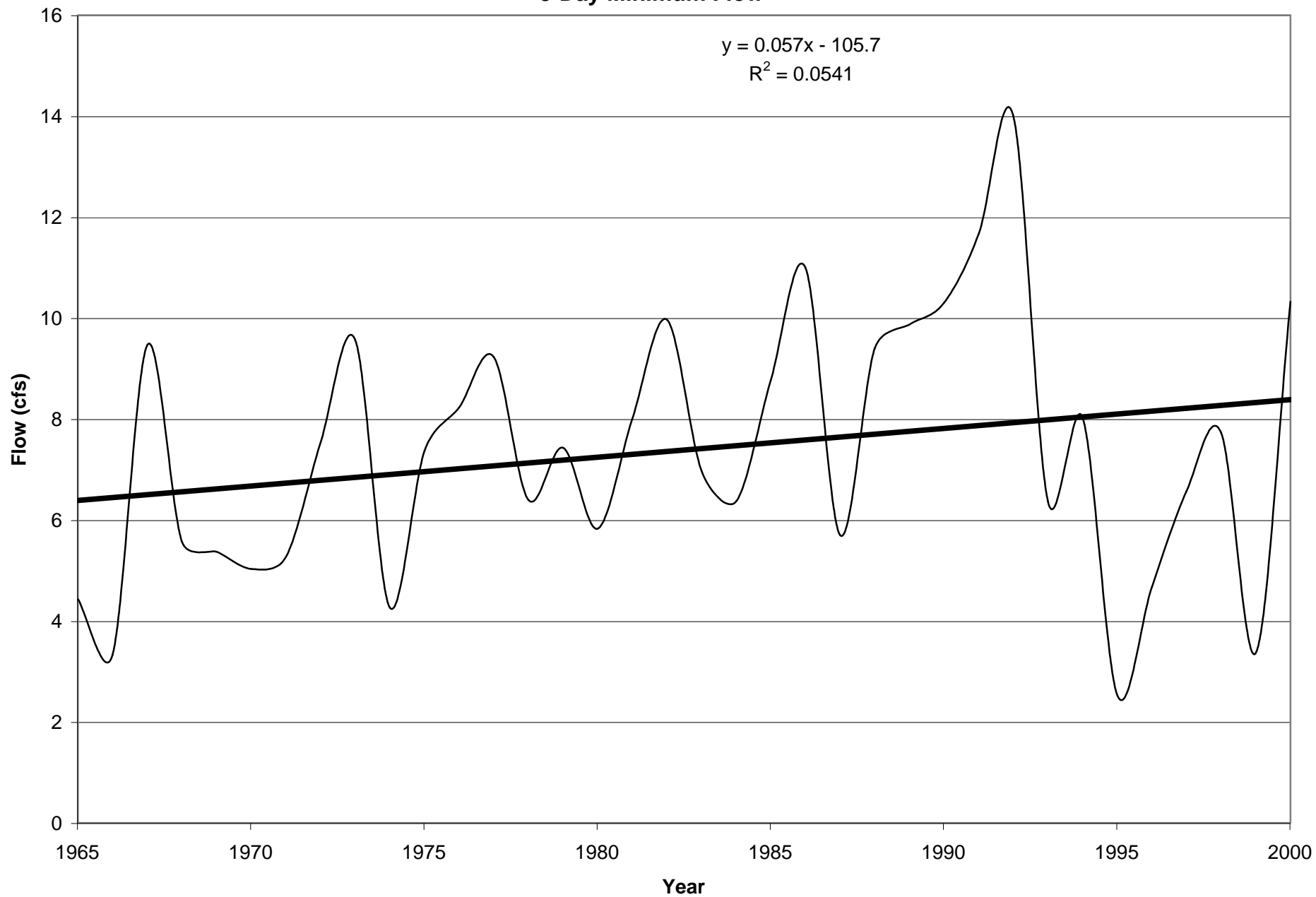
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Average Monthly Flow for September**



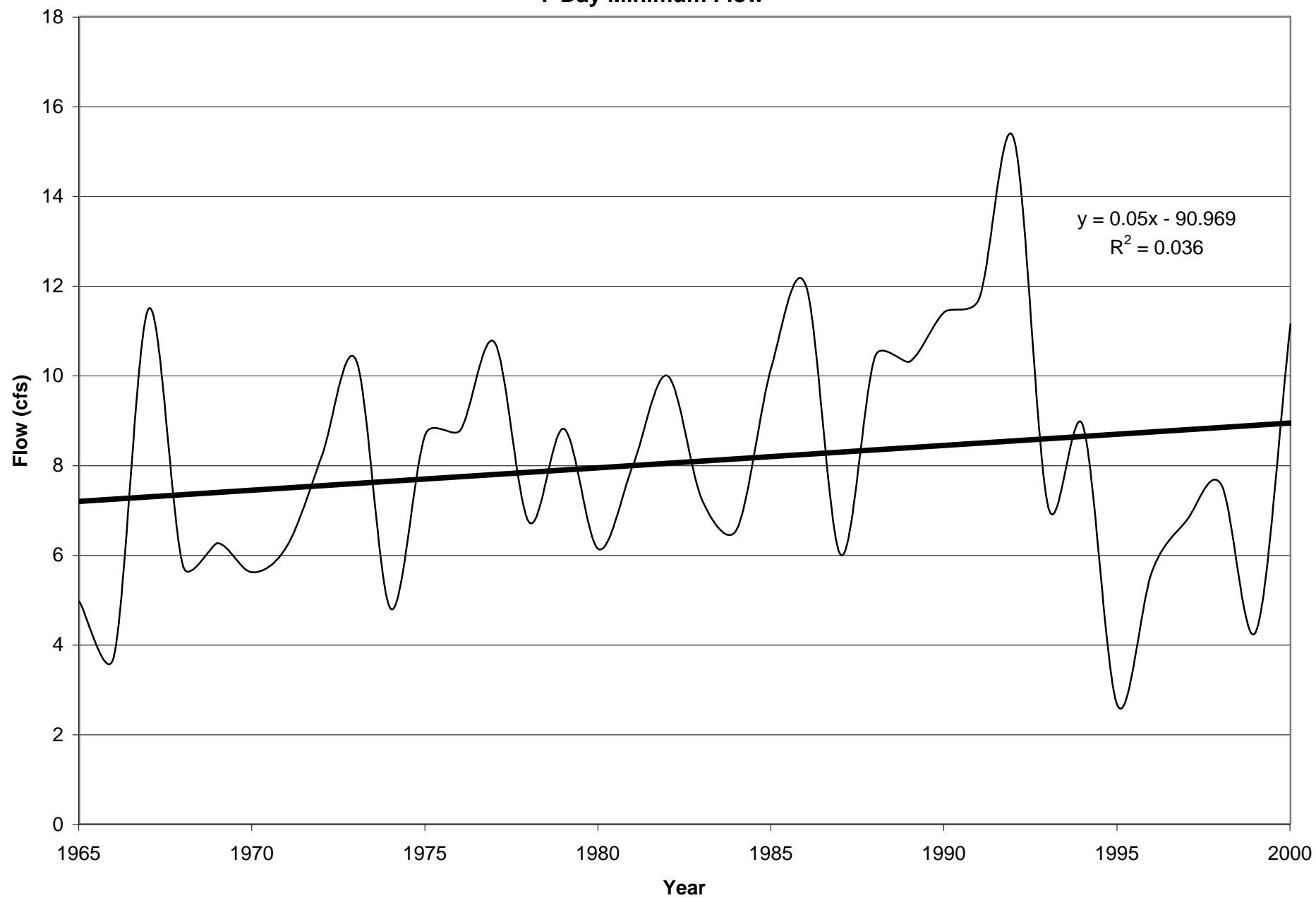
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**1-Day Minimum Flow**



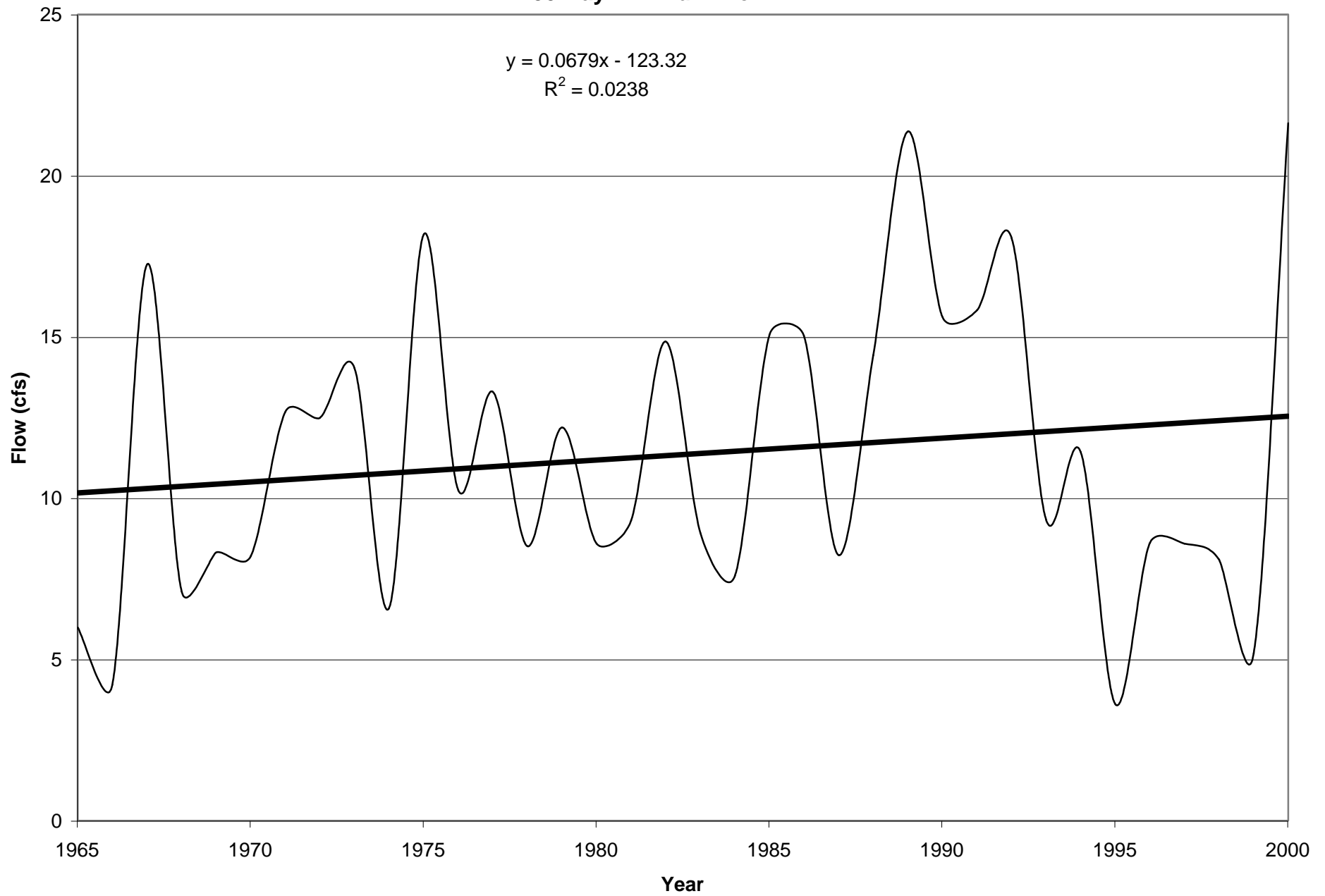
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**3-Day Minimum Flow**



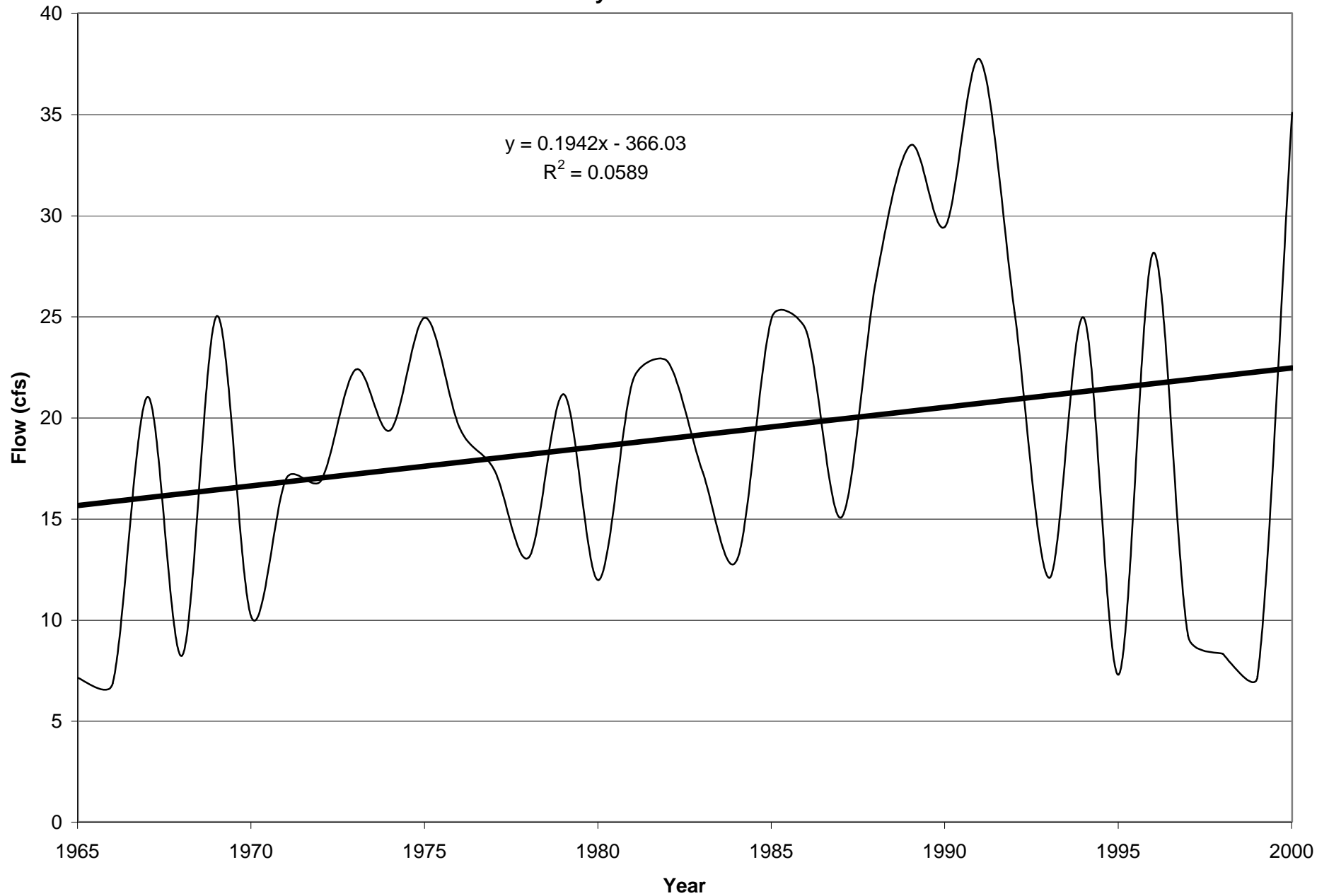
Otter River at Otter River, MA, Drainage Area=34.1 sq mi  
7-Day Minimum Flow



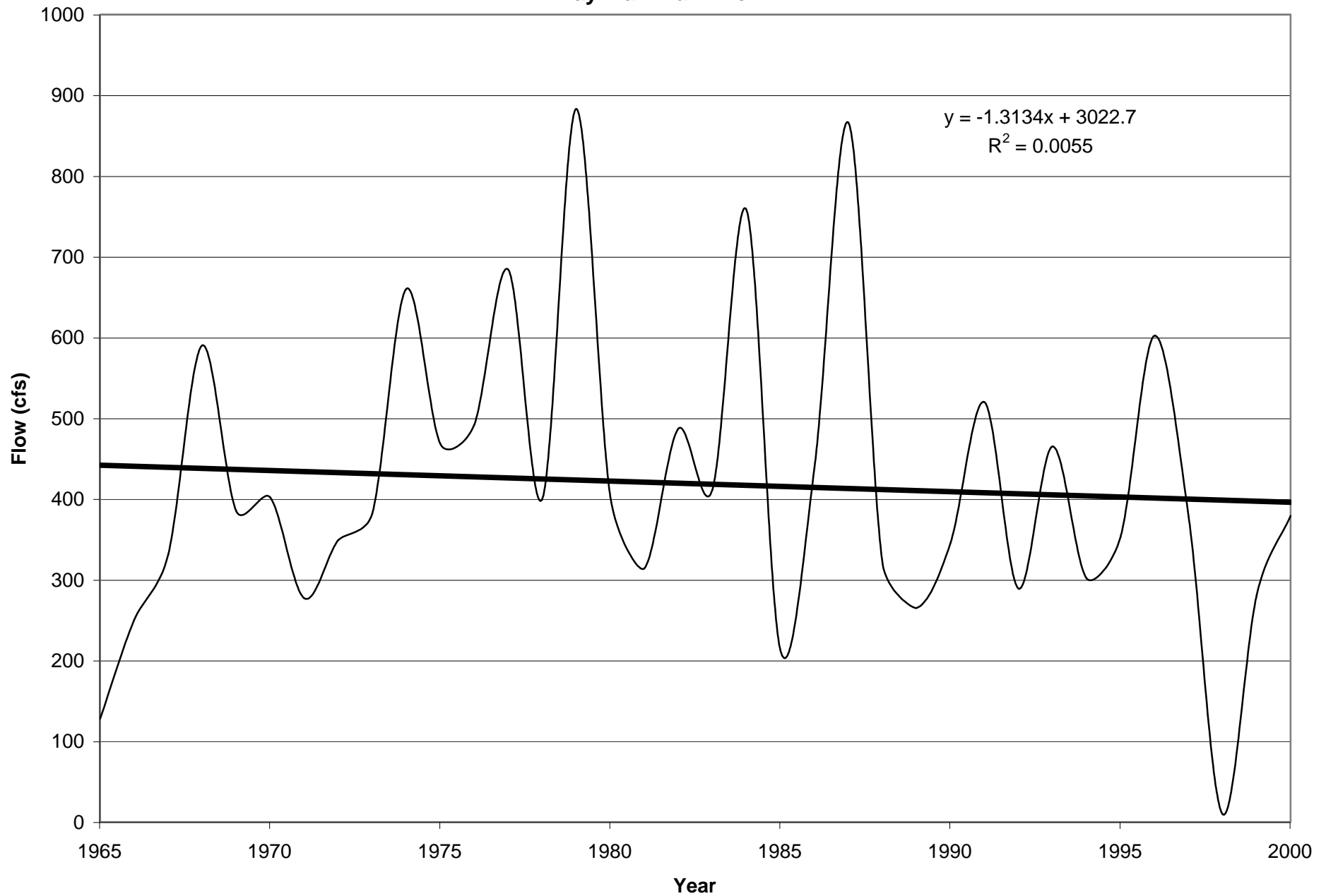
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**30-Day Minimum Flow**



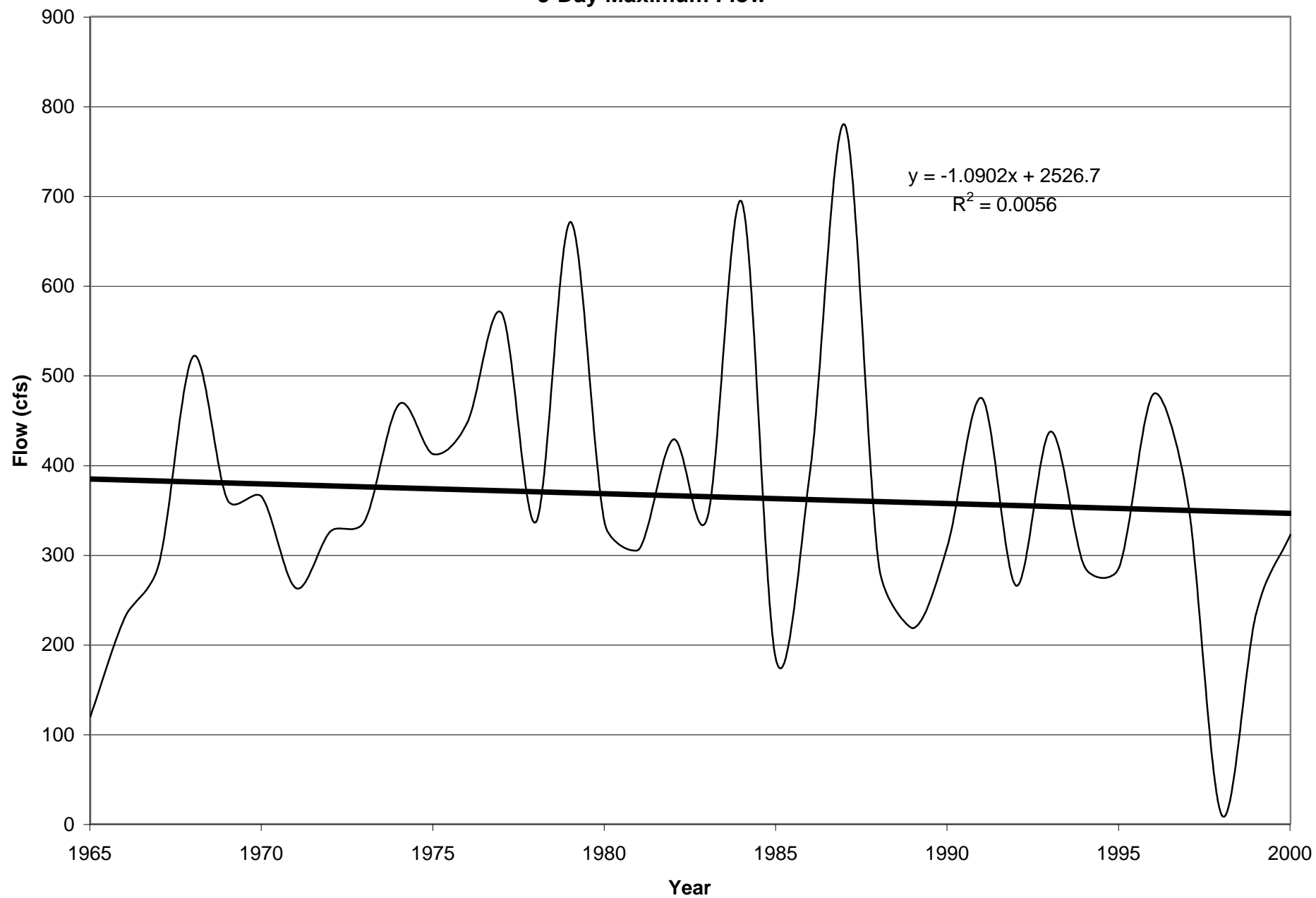
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**90-Day Minimum Flow**



**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**1-Day Maximum Flow**

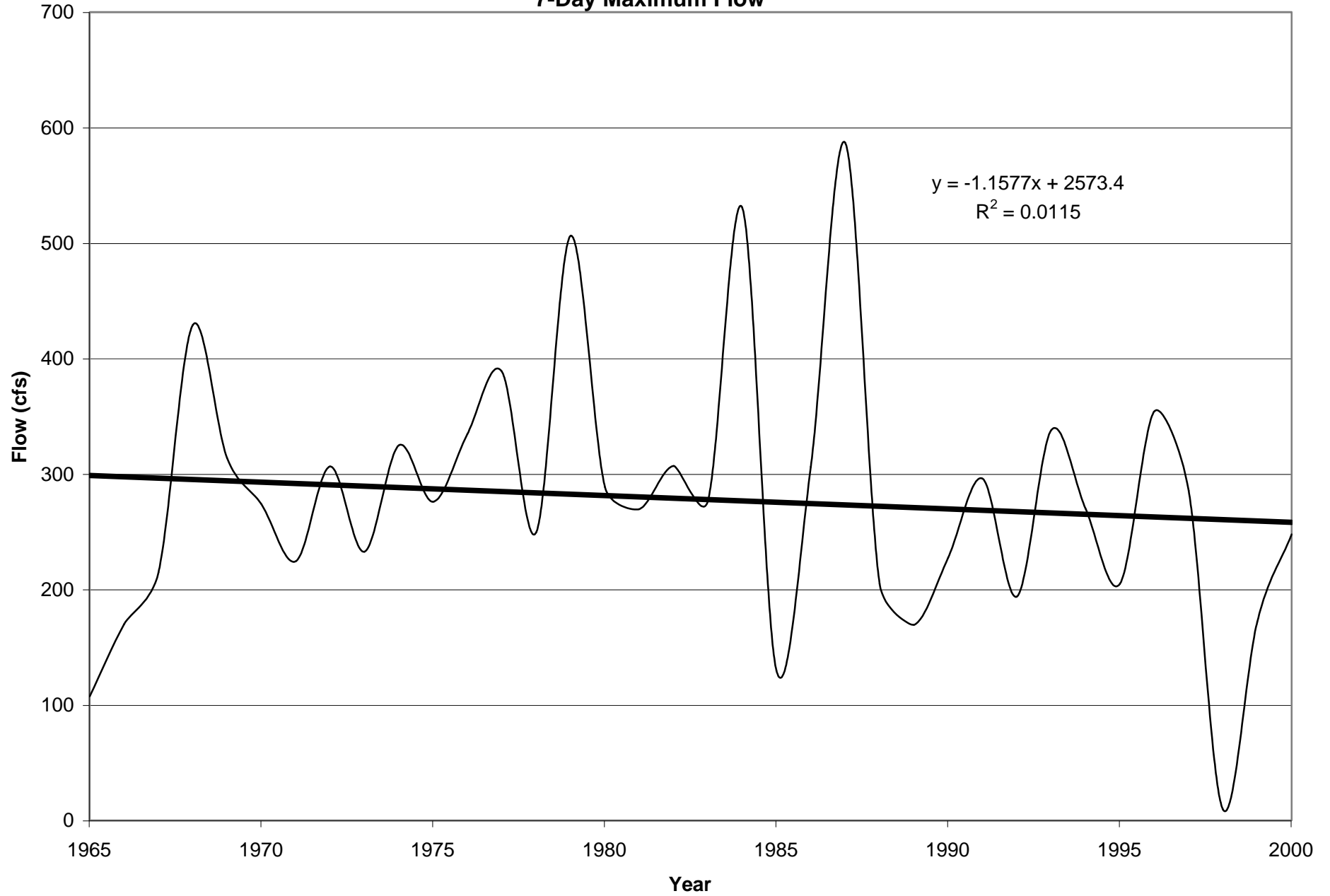


**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**3-Day Maximum Flow**

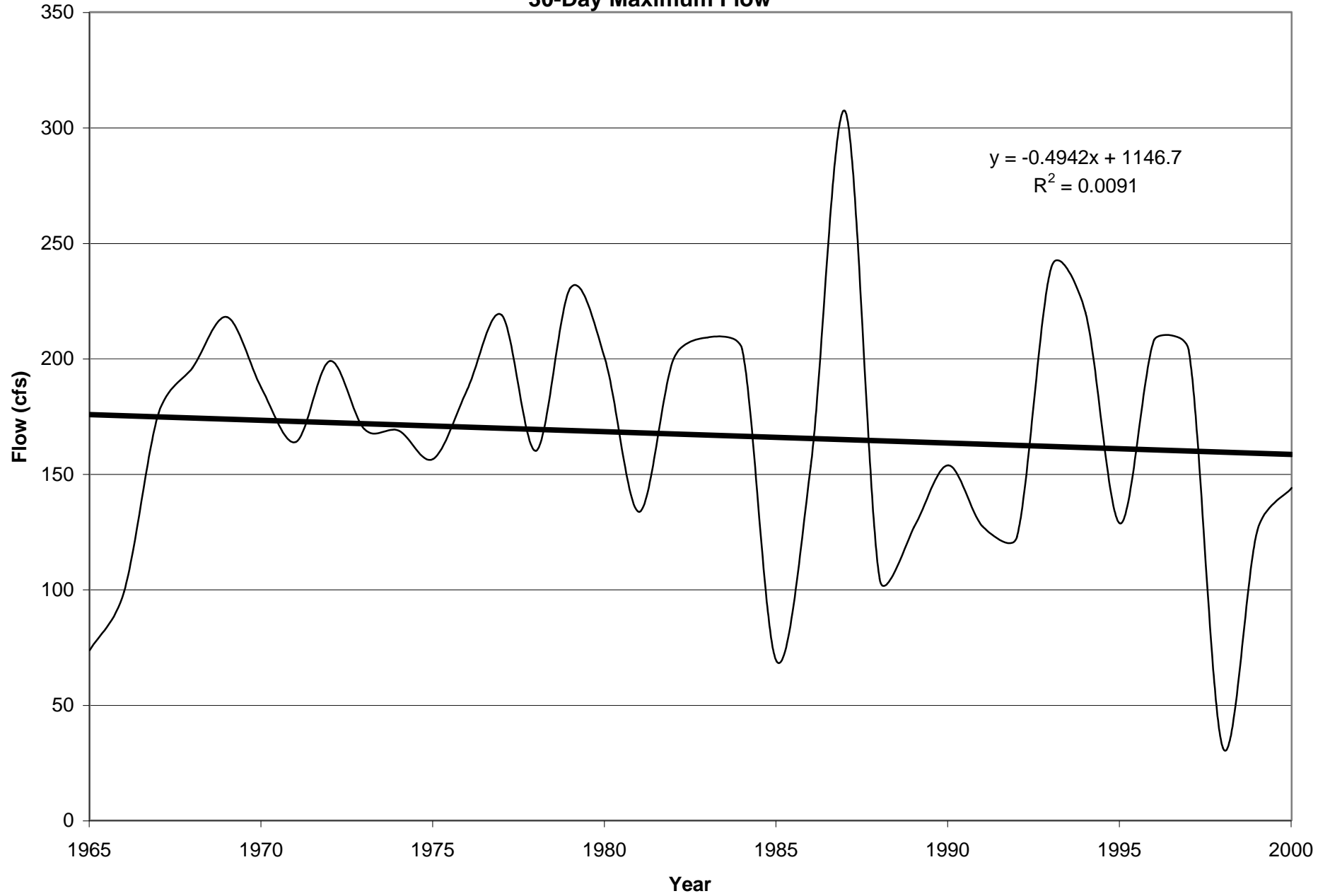




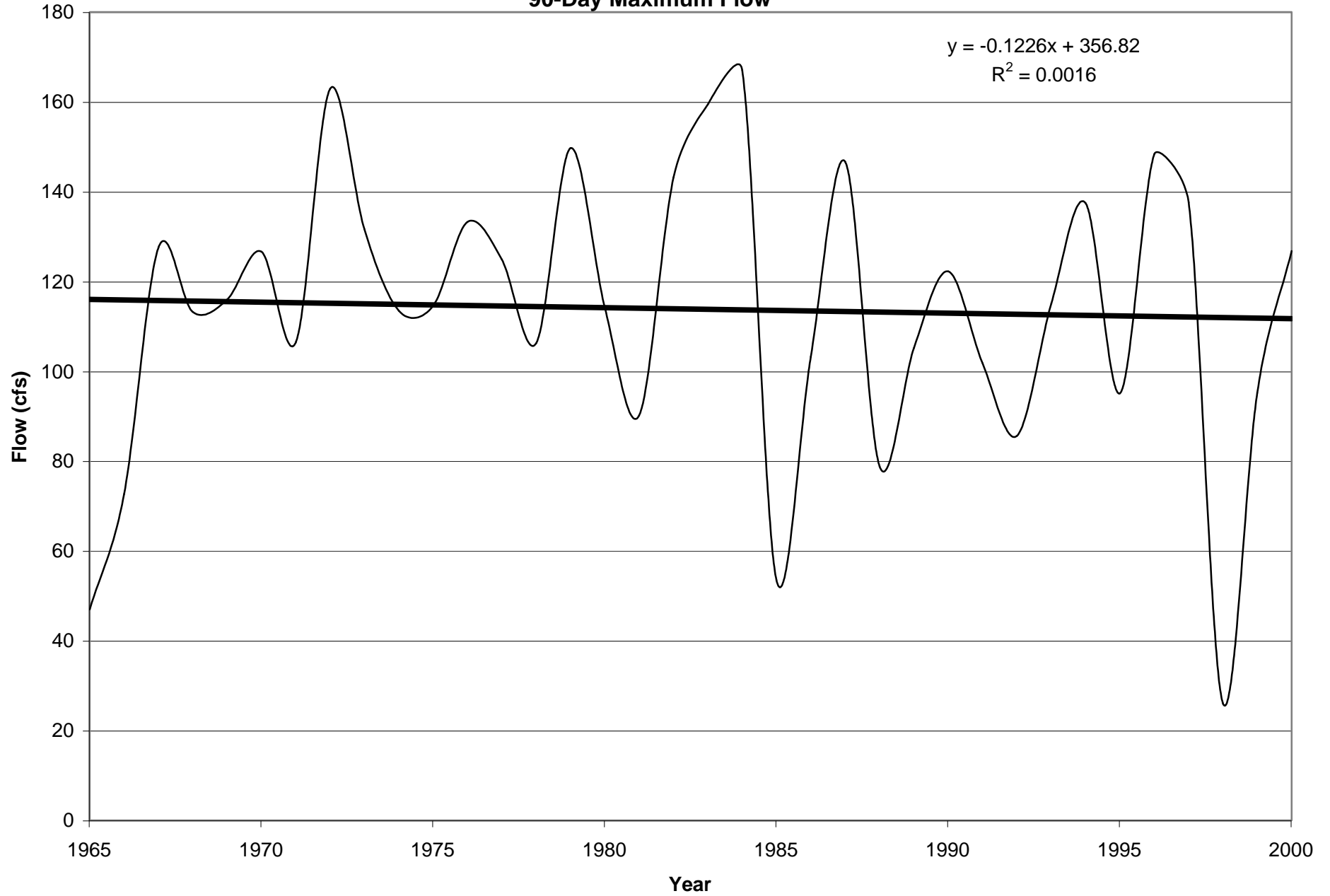
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**7-Day Maximum Flow**



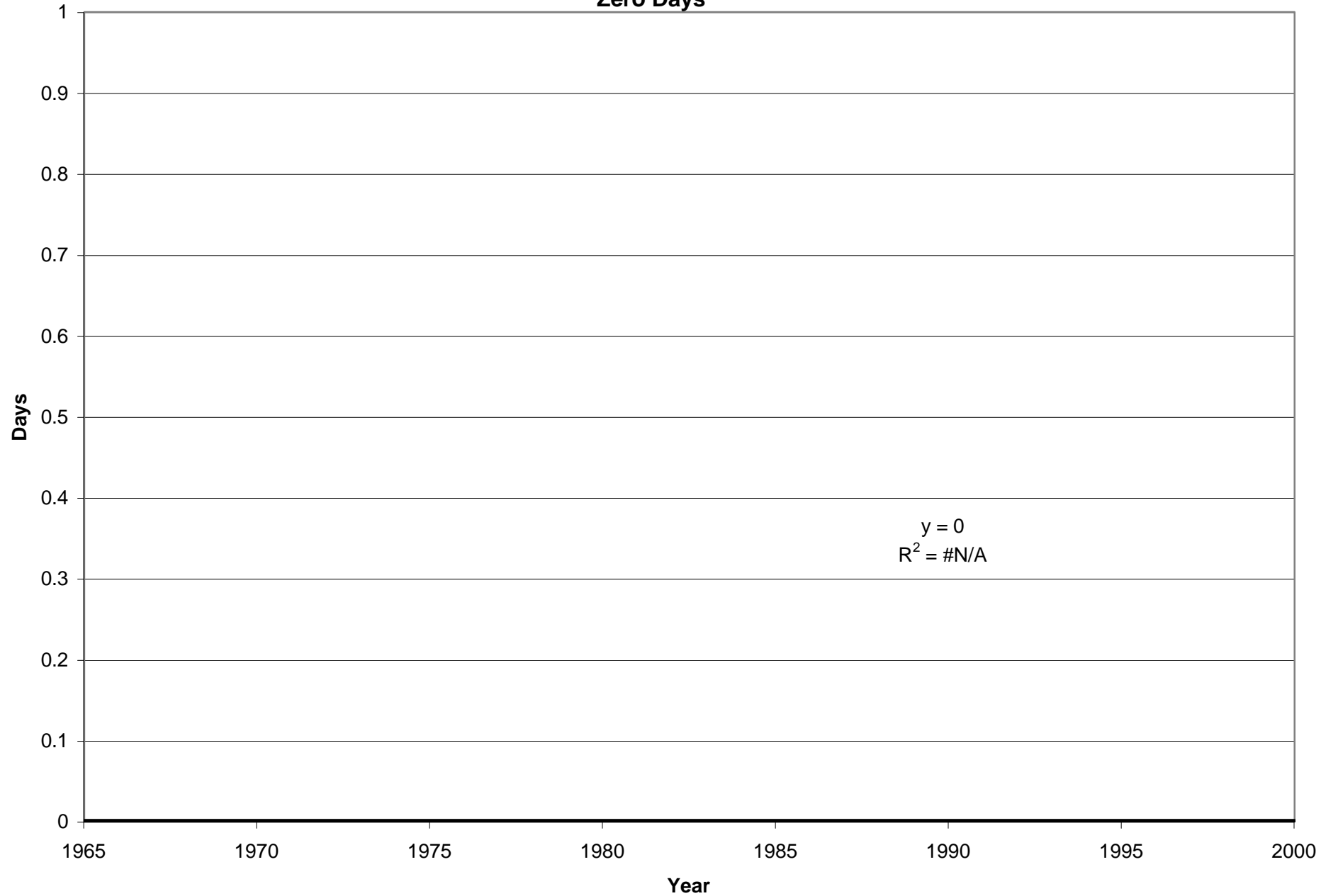
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**30-Day Maximum Flow**



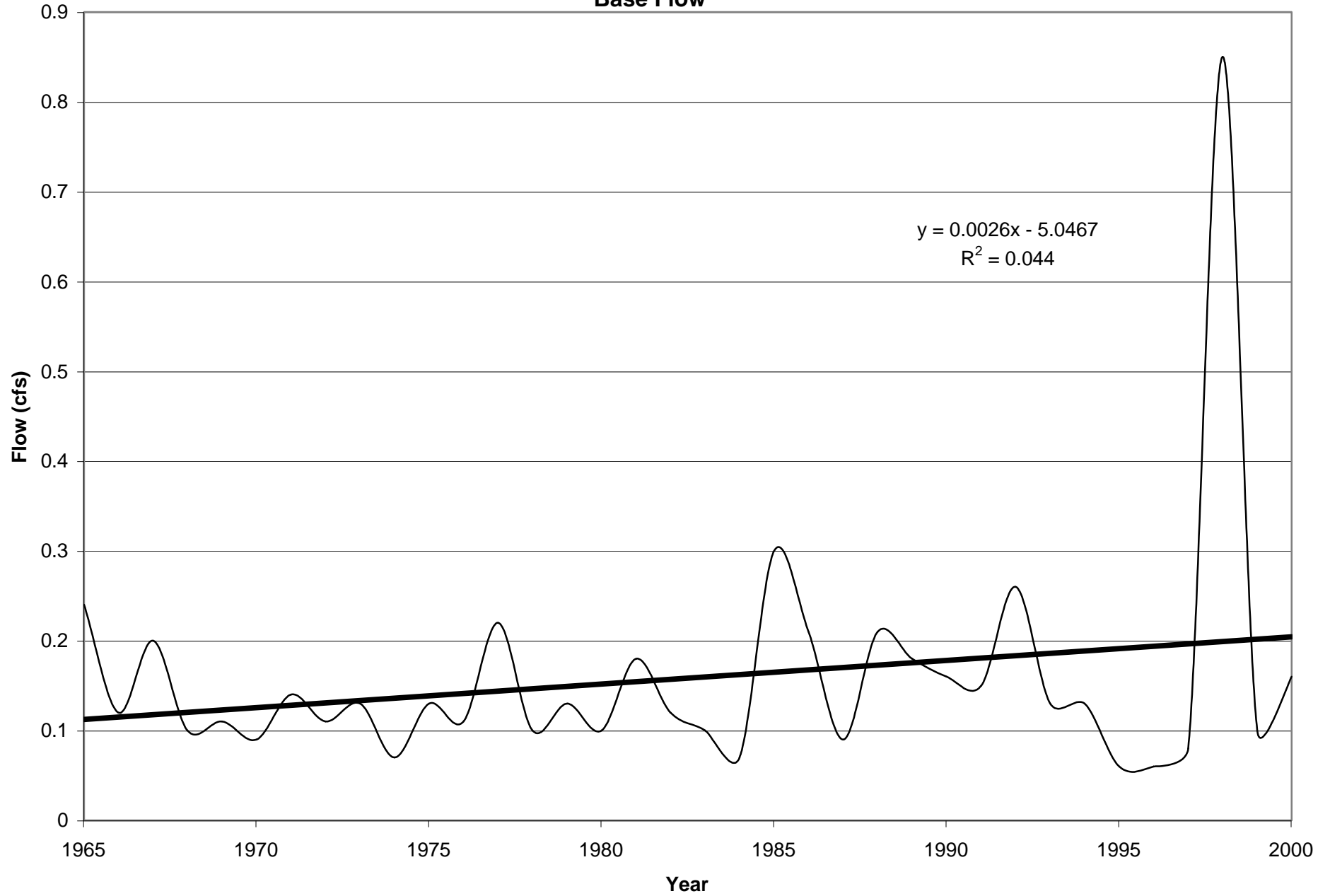
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**90-Day Maximum Flow**



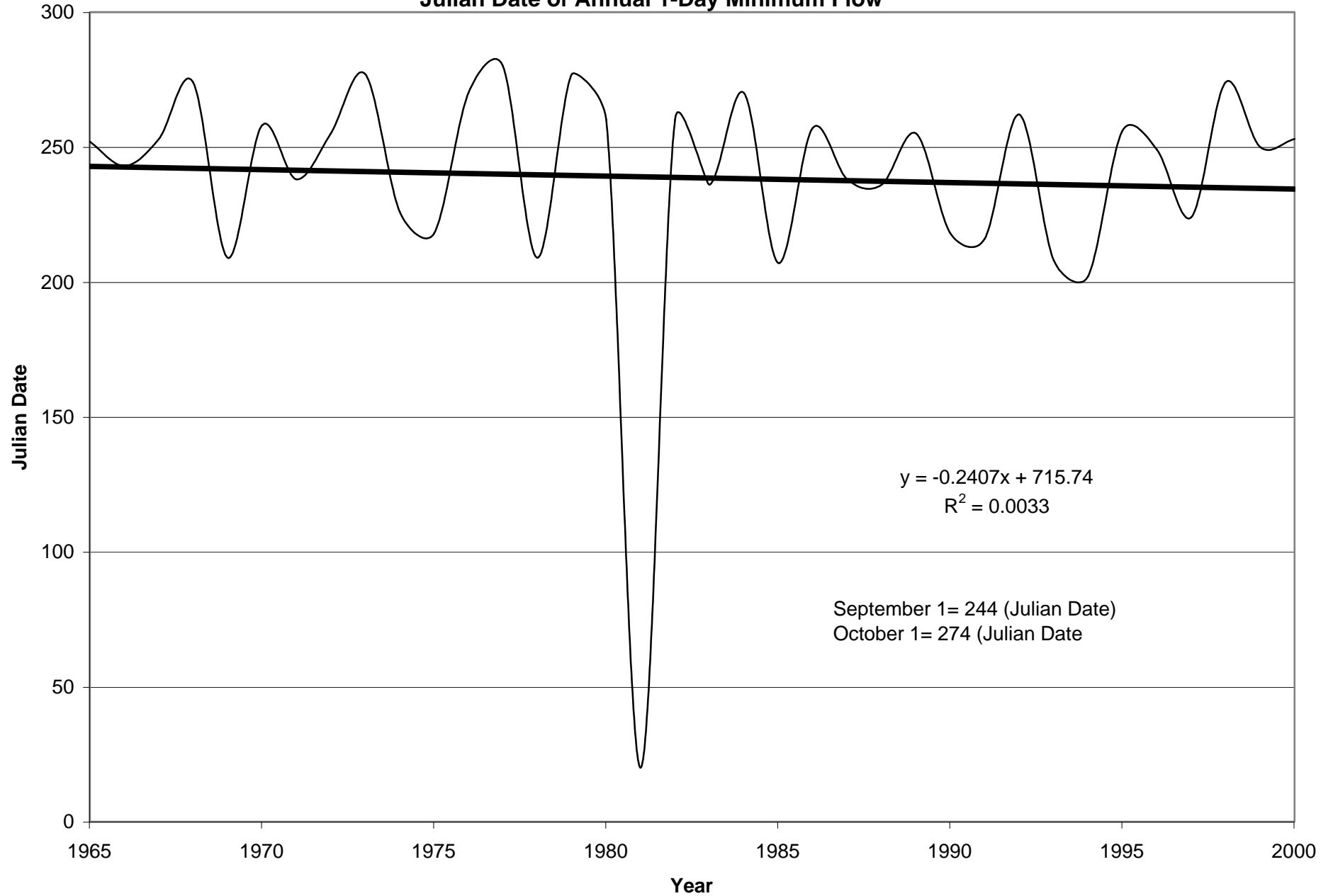
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Zero Days**



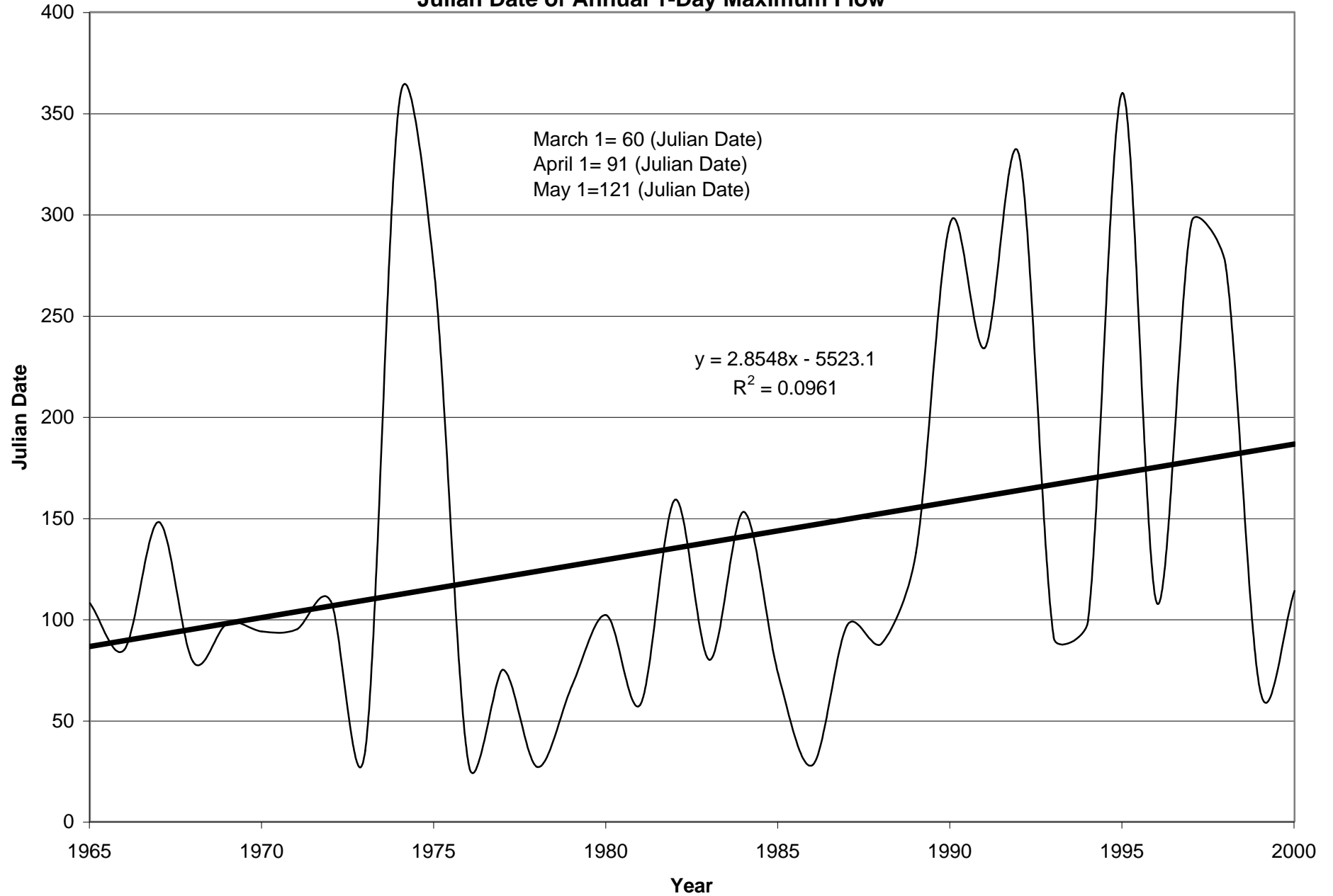
Otter River at Otter River, MA, Drainage Area=34.1 sq mi  
Base Flow



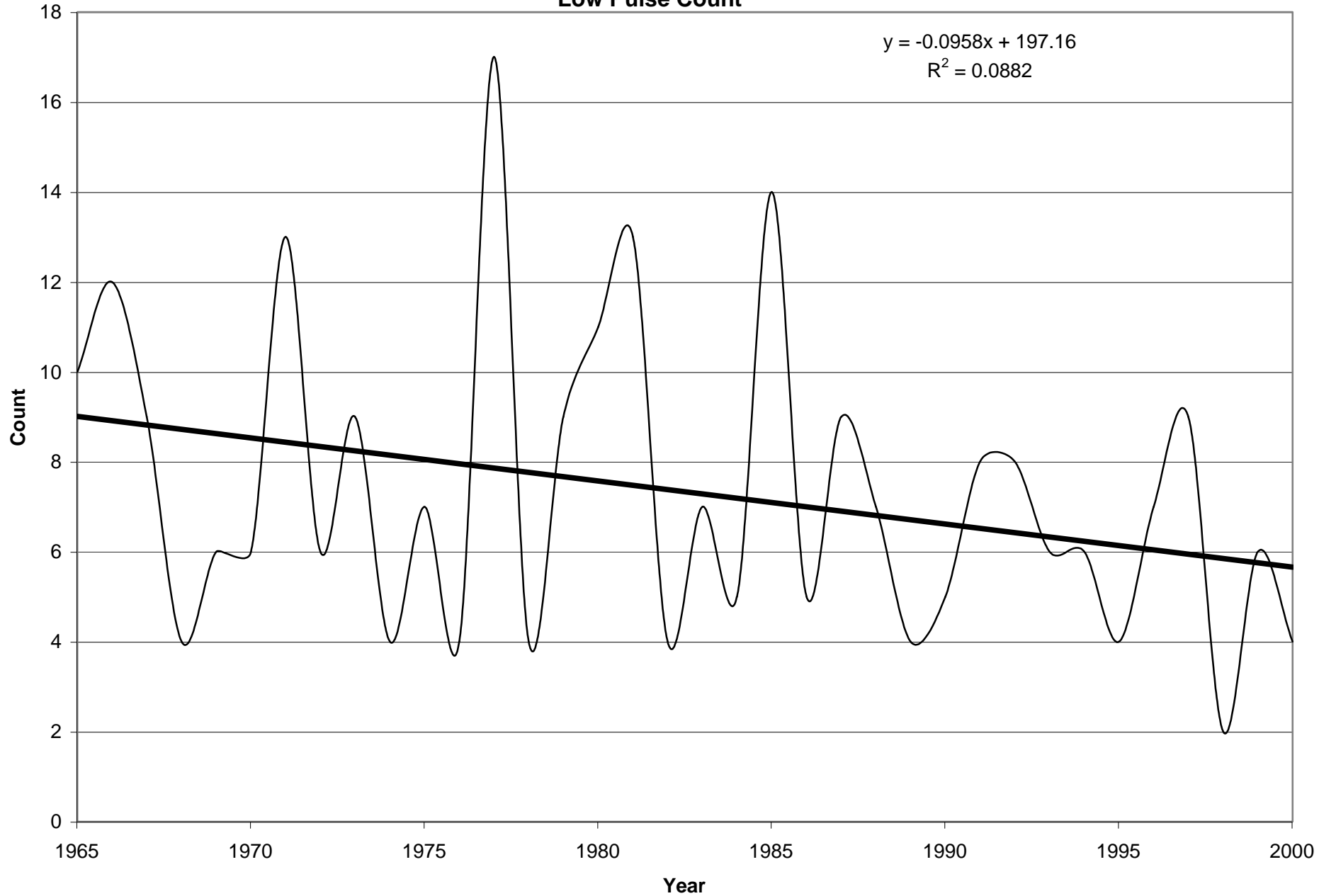
Otter River at Otter River, MA, Drainage Area=34.1 sq mi  
Julian Date of Annual 1-Day Minimum Flow



**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Julian Date of Annual 1-Day Maximum Flow**

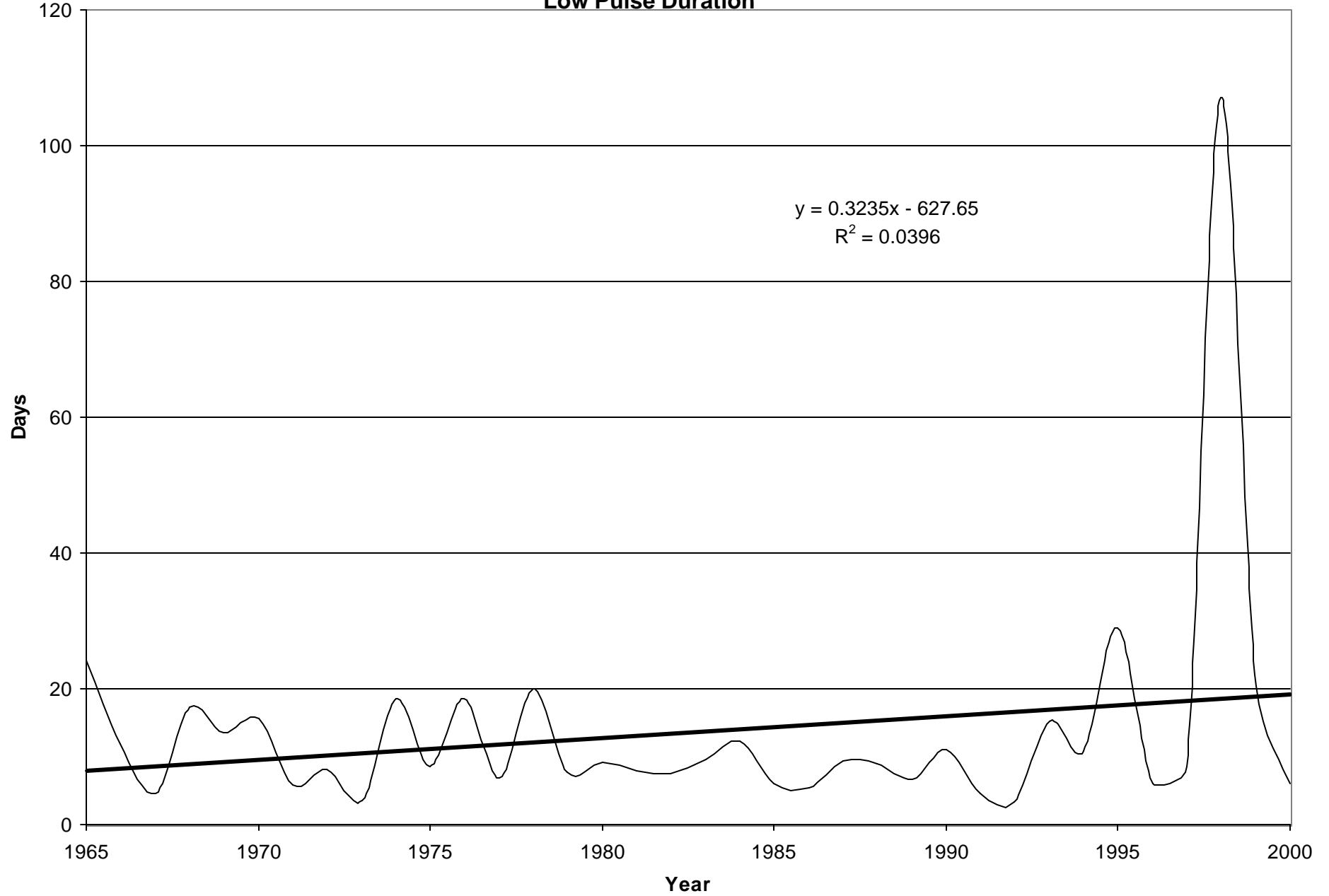


**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Low Pulse Count**

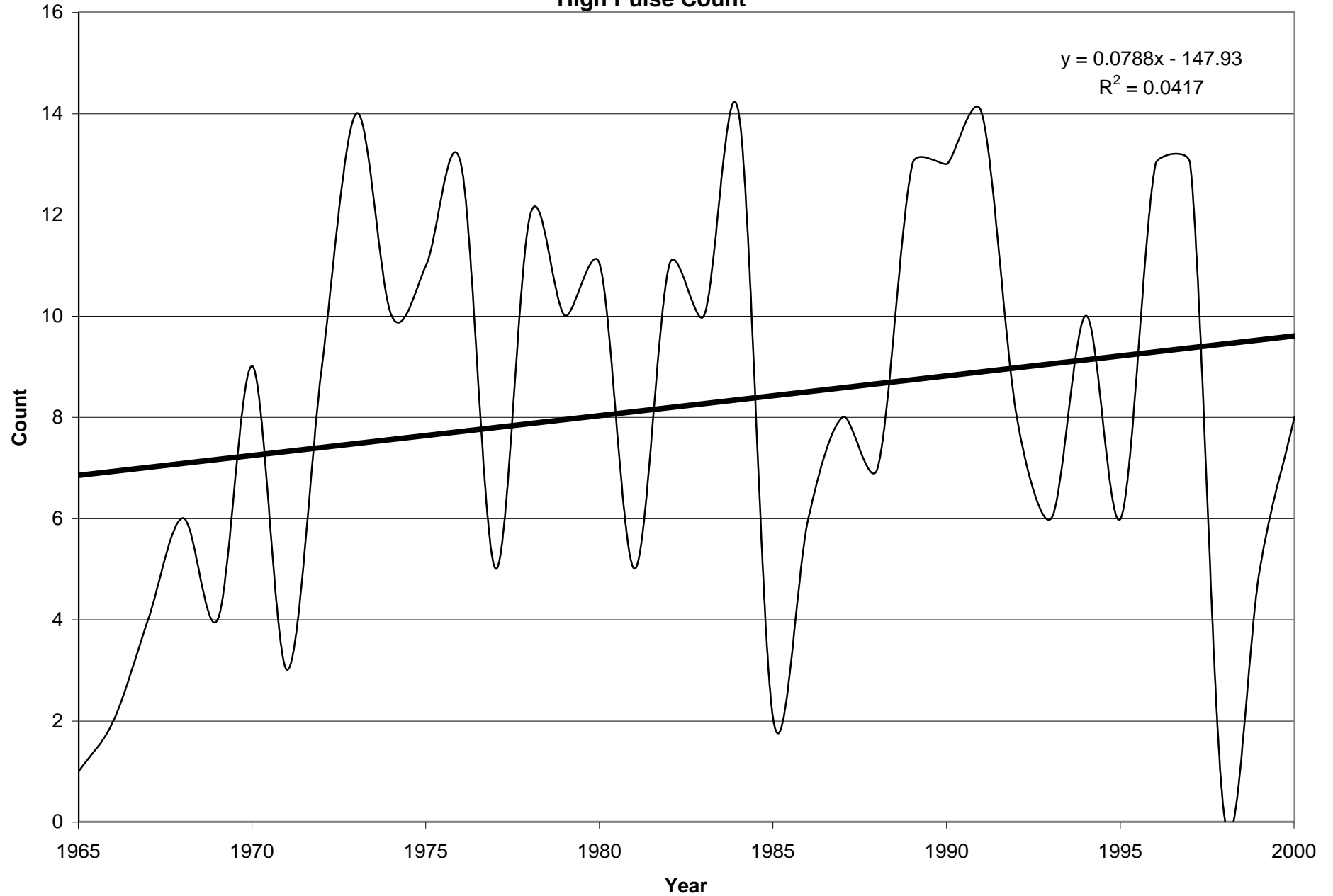




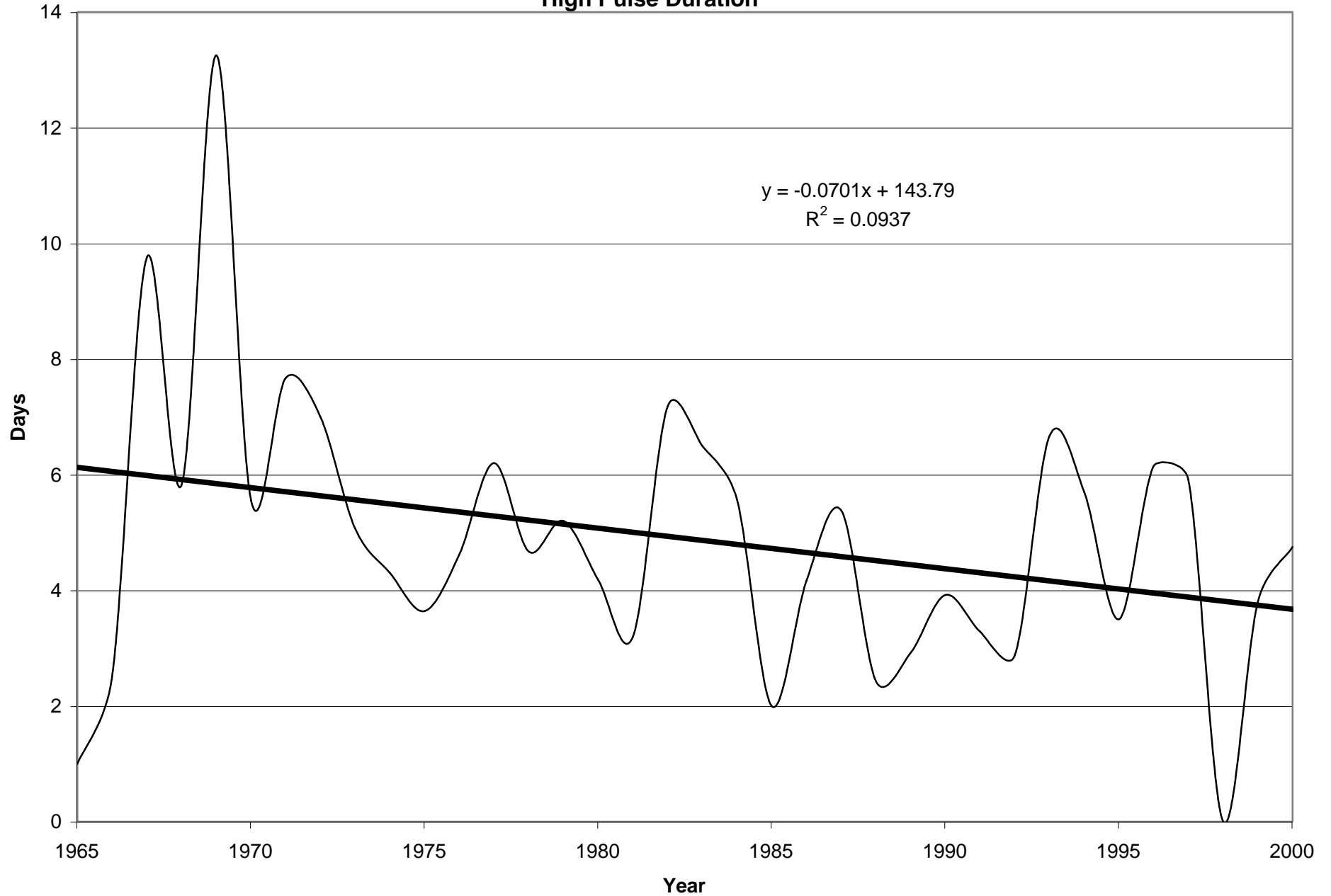
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**Low Pulse Duration**



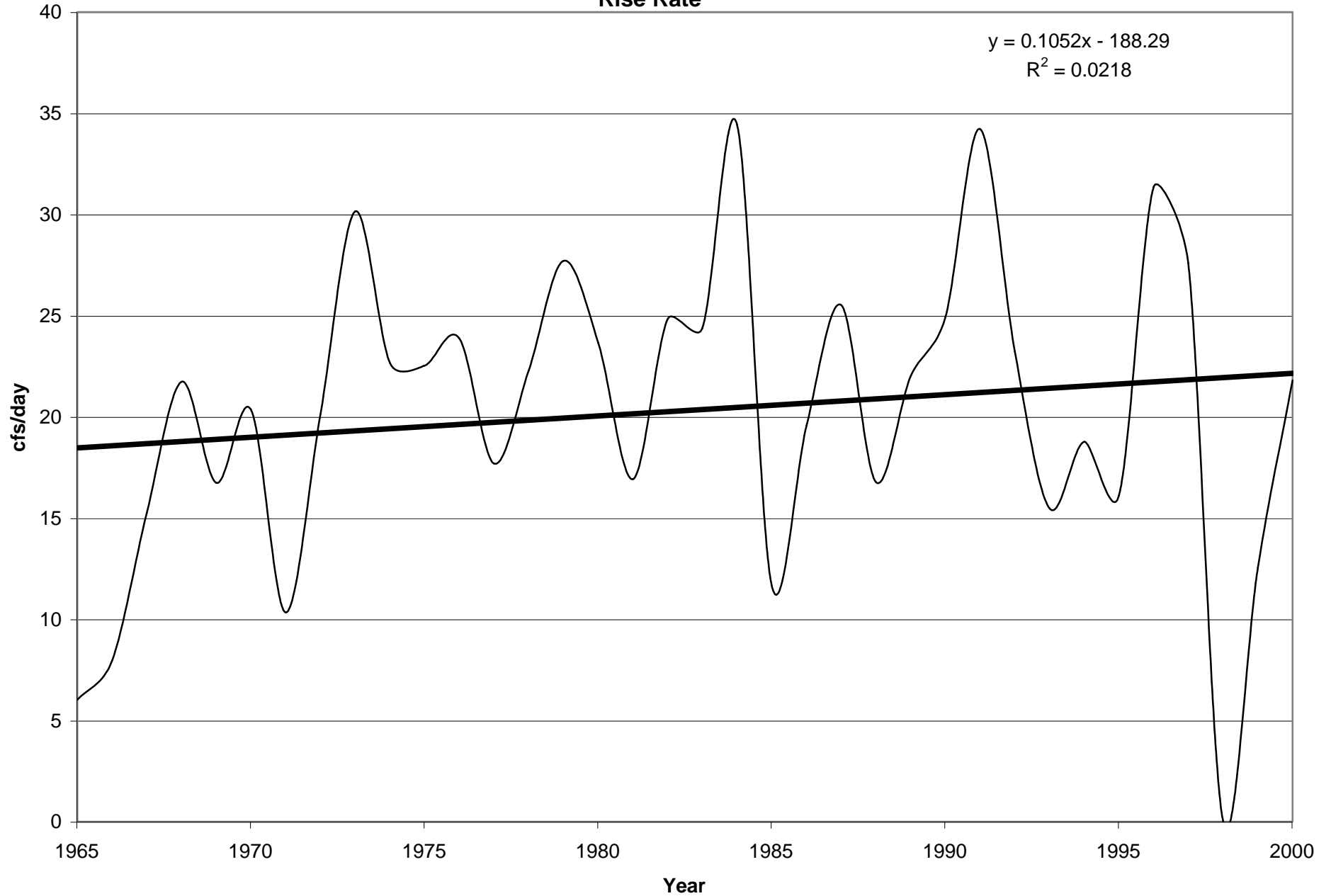
Otter River at Otter River, MA, Drainage Area=34.1 sq mi  
High Pulse Count



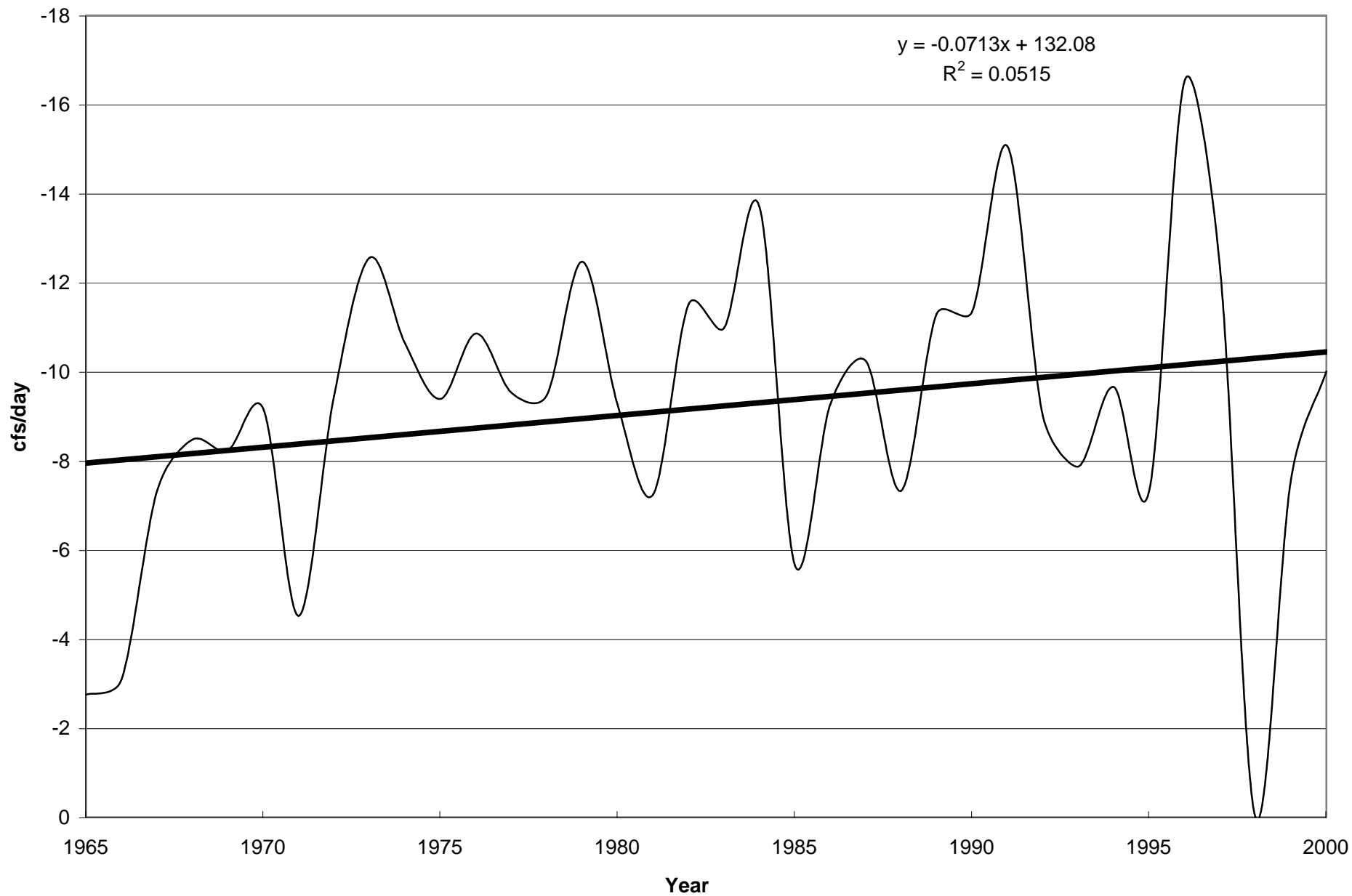
**Otter River at Otter River, MA, Drainage Area=34.1 sq mi**  
**High Pulse Duration**



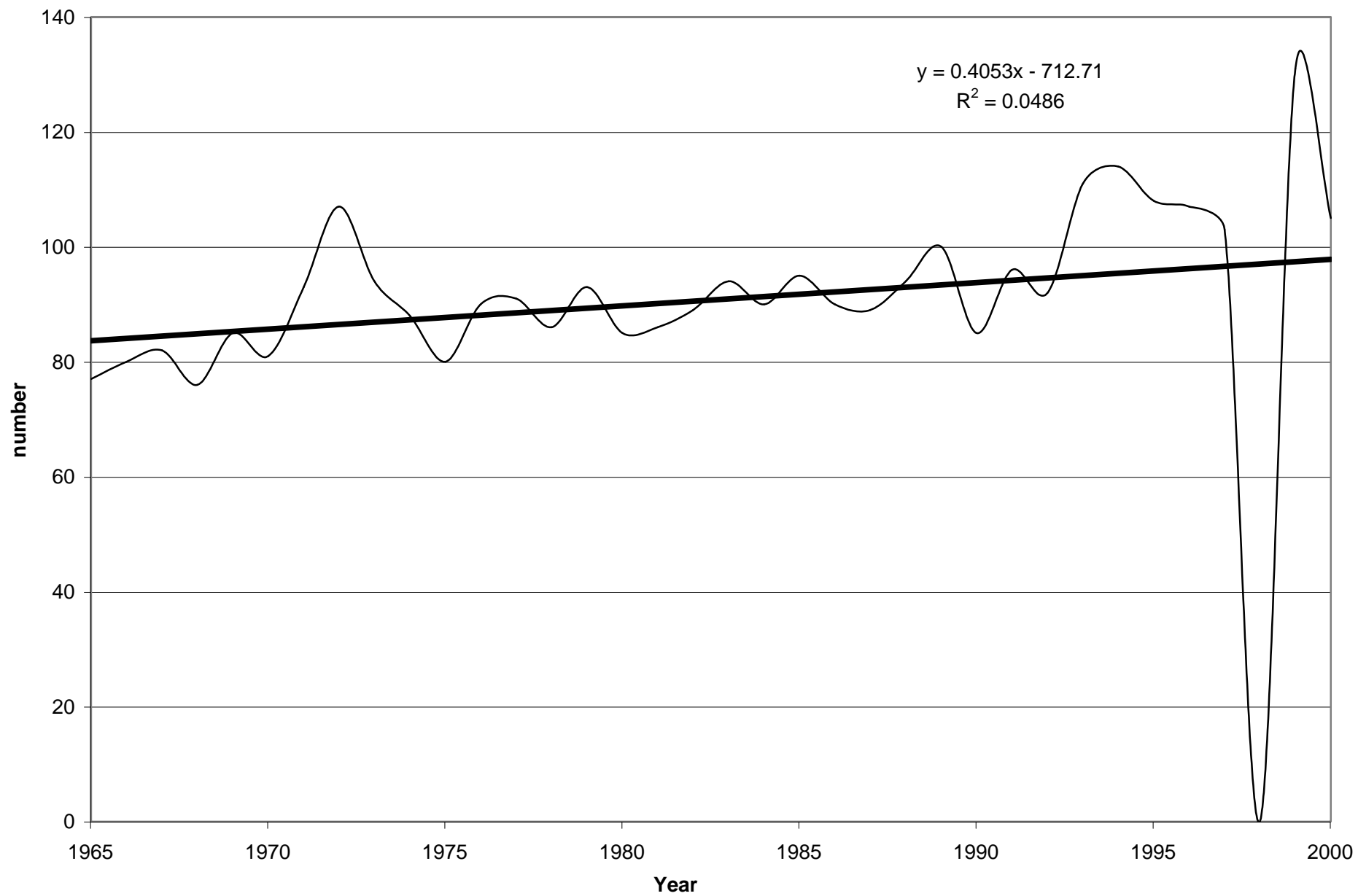
Otter River at Otter River, MA, Drainage Area=34.1 sq mi  
Rise Rate



Otter River at Otter River, MA, Drainage Area=34.1 sq mi  
Fall Rate



**Otter River at Otter River, MA, Drainage Area=34.1 sq mi  
Reversals**

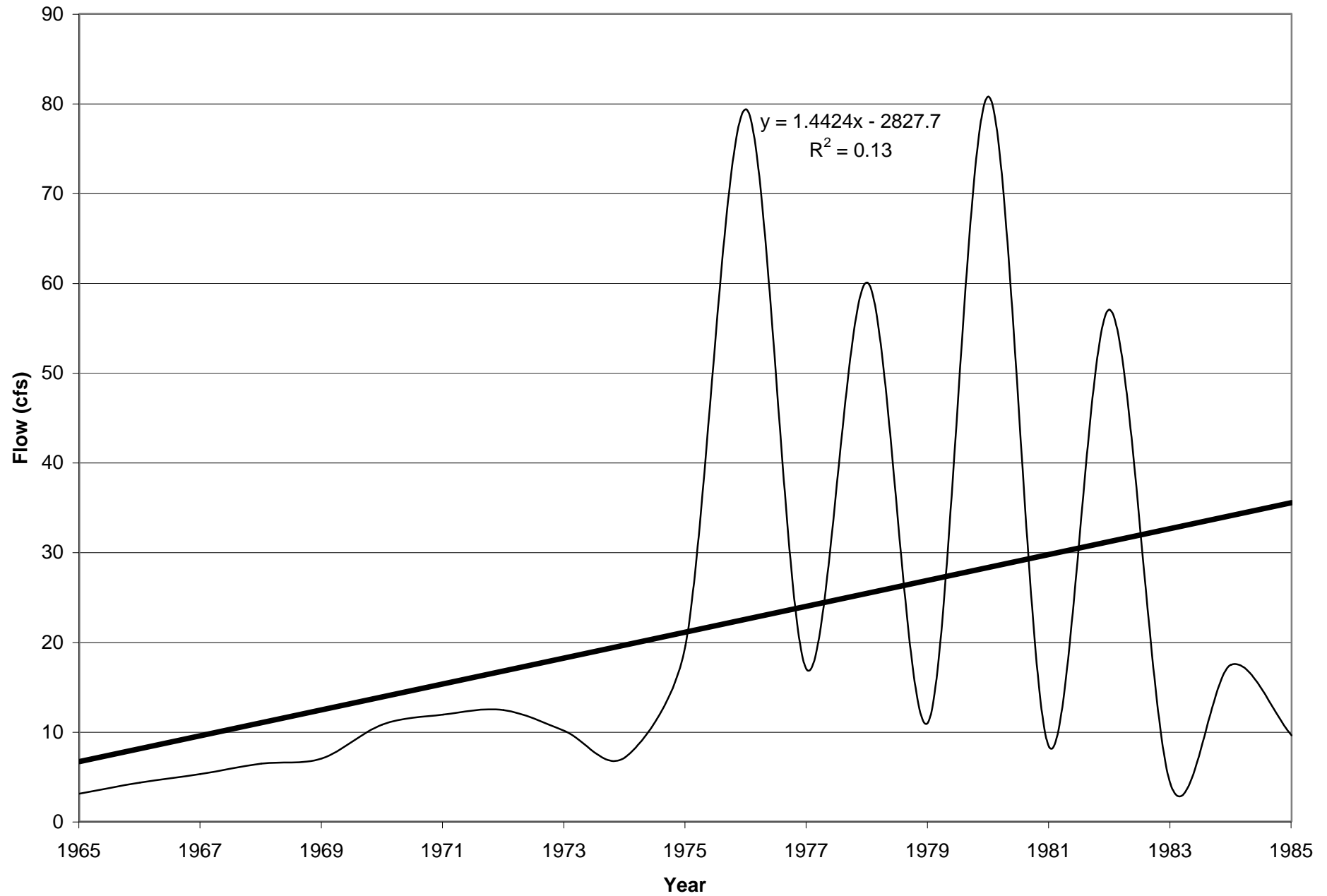


**Lake Rohunta Outlet near Athol, MA**  
**Drainage Area= 20.3 square miles**  
**Period of Record: Water Years 1965-1985**  
***IHA Results***

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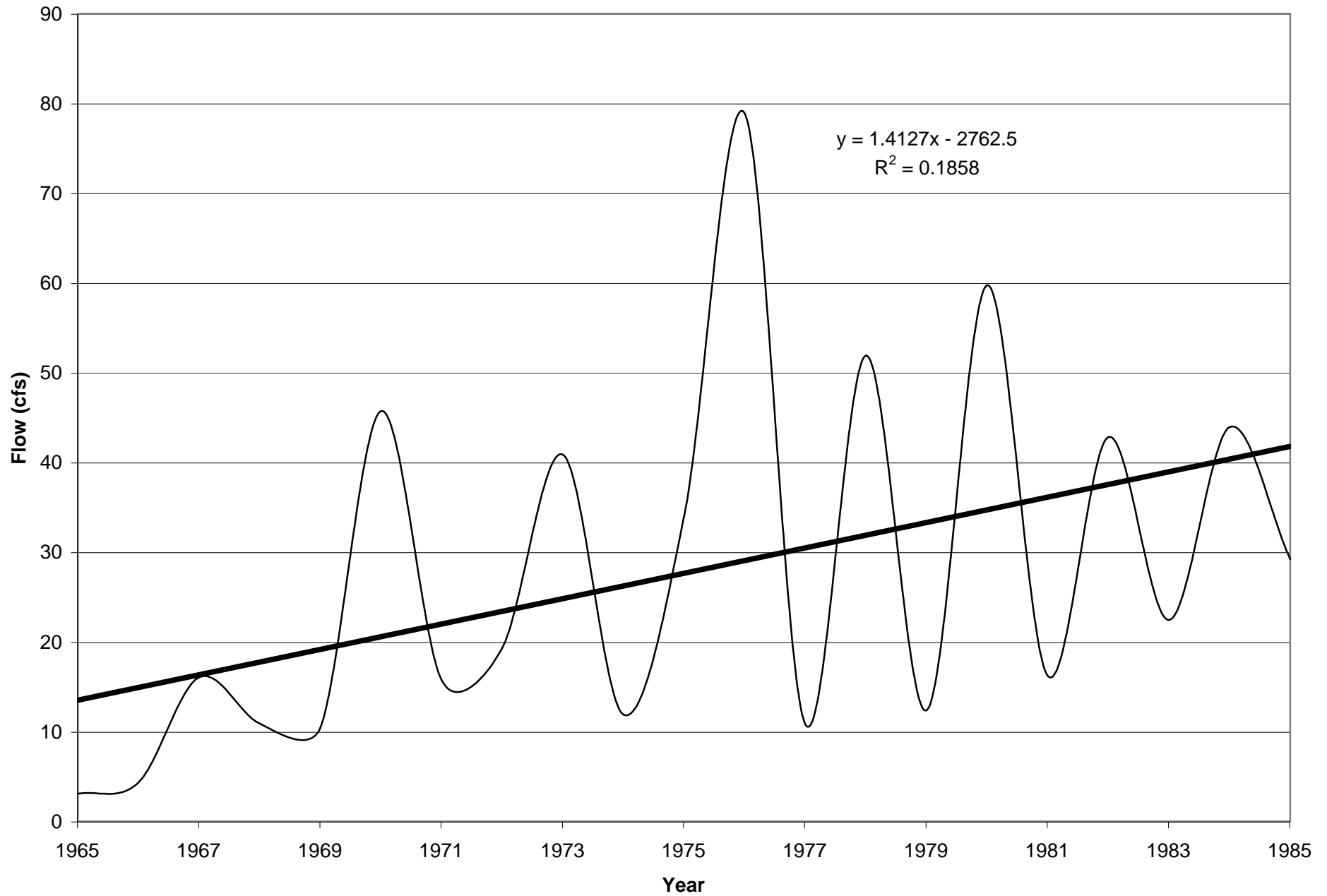
1. Average Monthly Flow for October
2. Average Monthly Flow for November
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4. Average Monthly Flow for January
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26. Julian Date of Annual 1-Day Maximum Flow
27. Low Pulse Count
28. Low Pulse Duration
29. High Pulse Count
30. High Pulse Duration
31. Rise Rate
32. Fall Rate
33. Reversals

Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi  
Average Monthly Flow for October

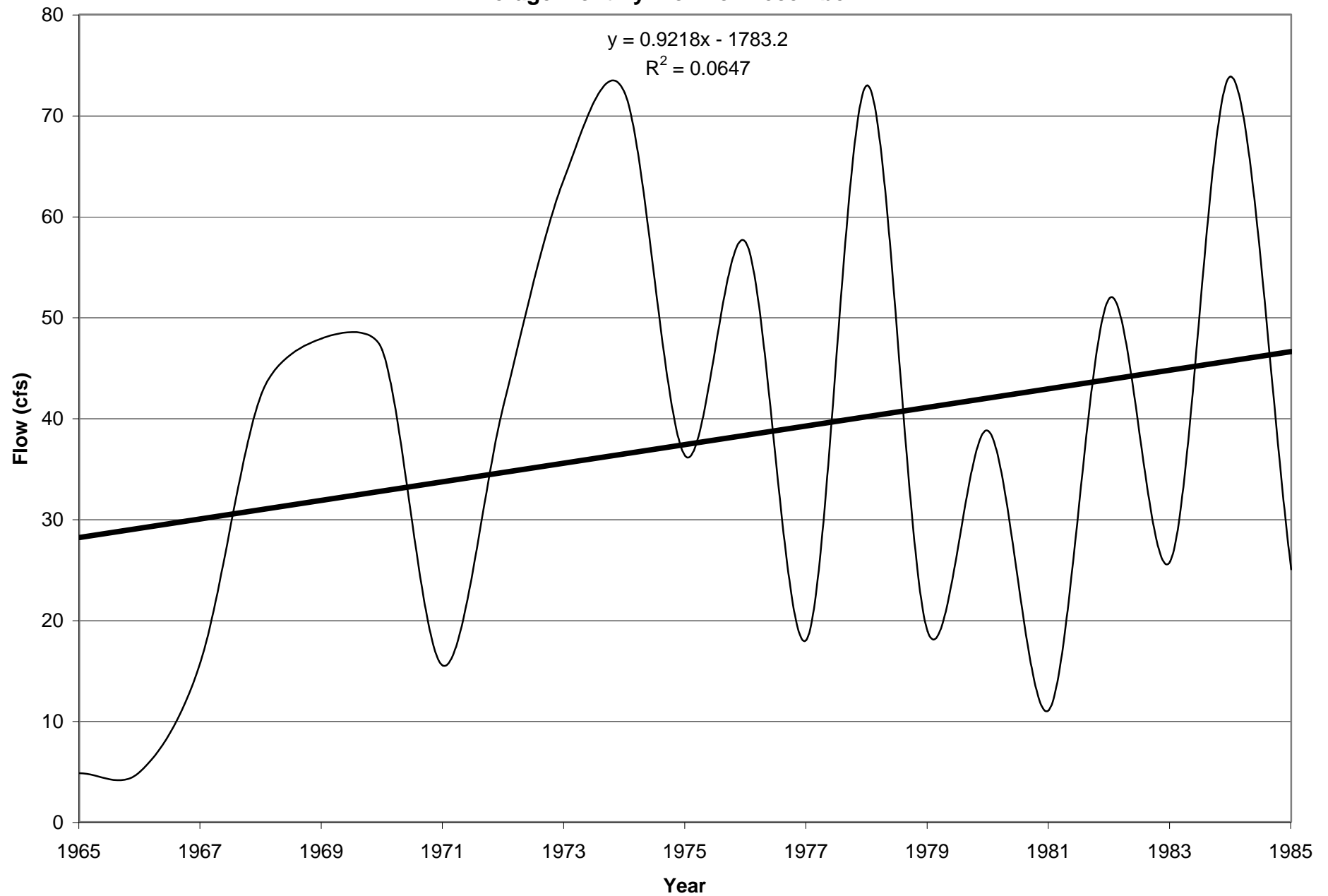




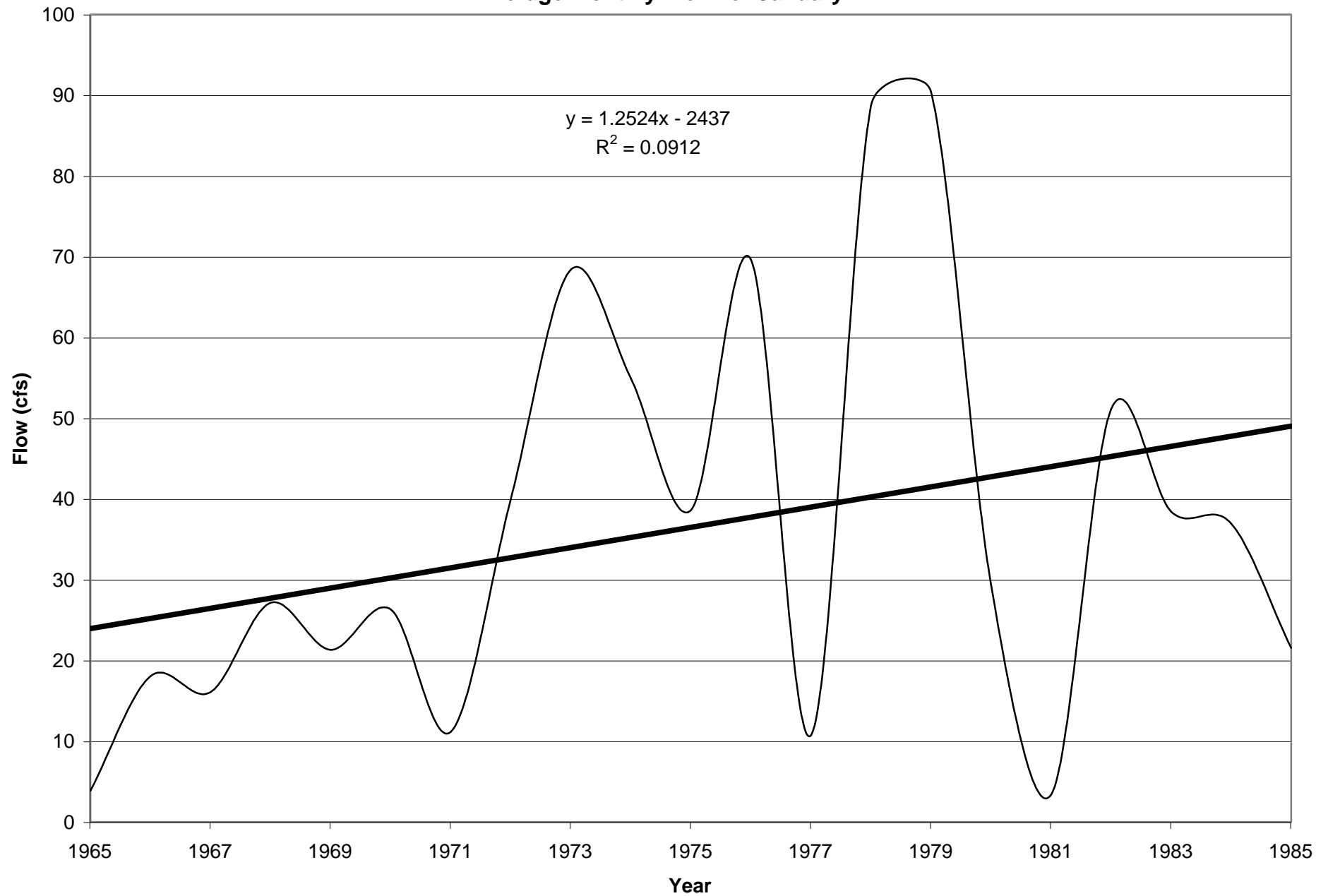
Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi  
Average Monthly Flow for November



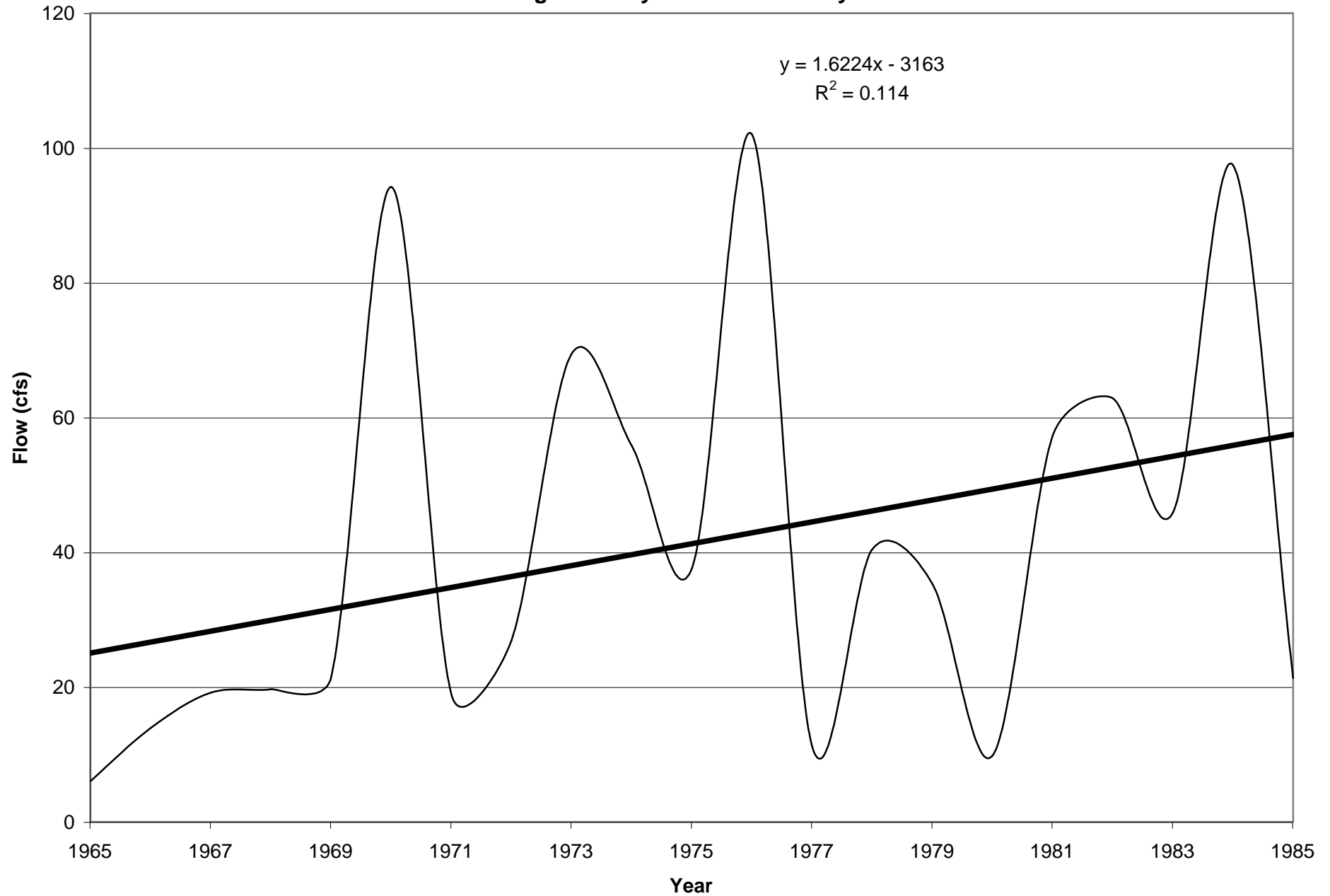
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Average Monthly Flow for December**



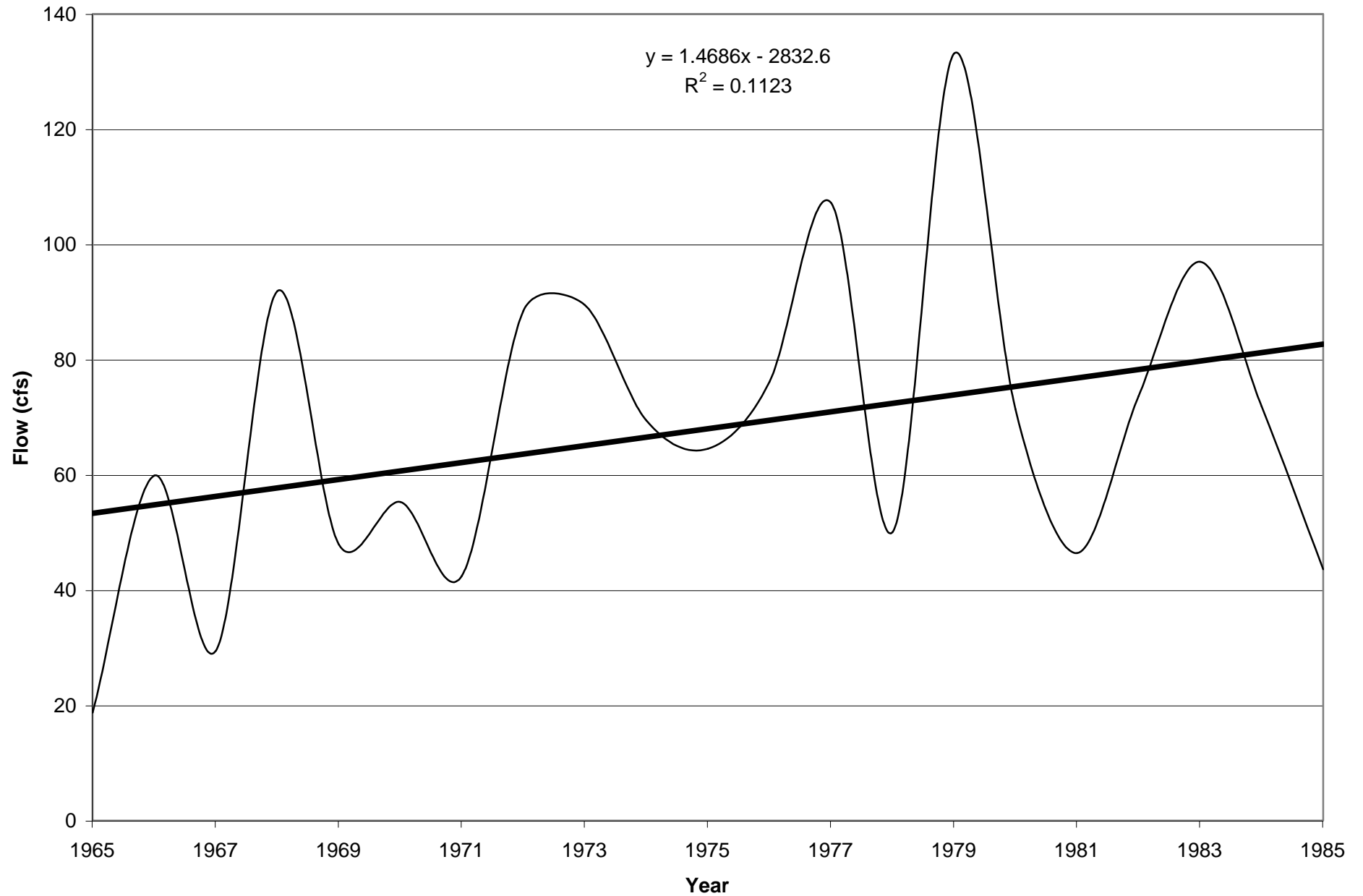
Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi  
Average Monthly Flow for January



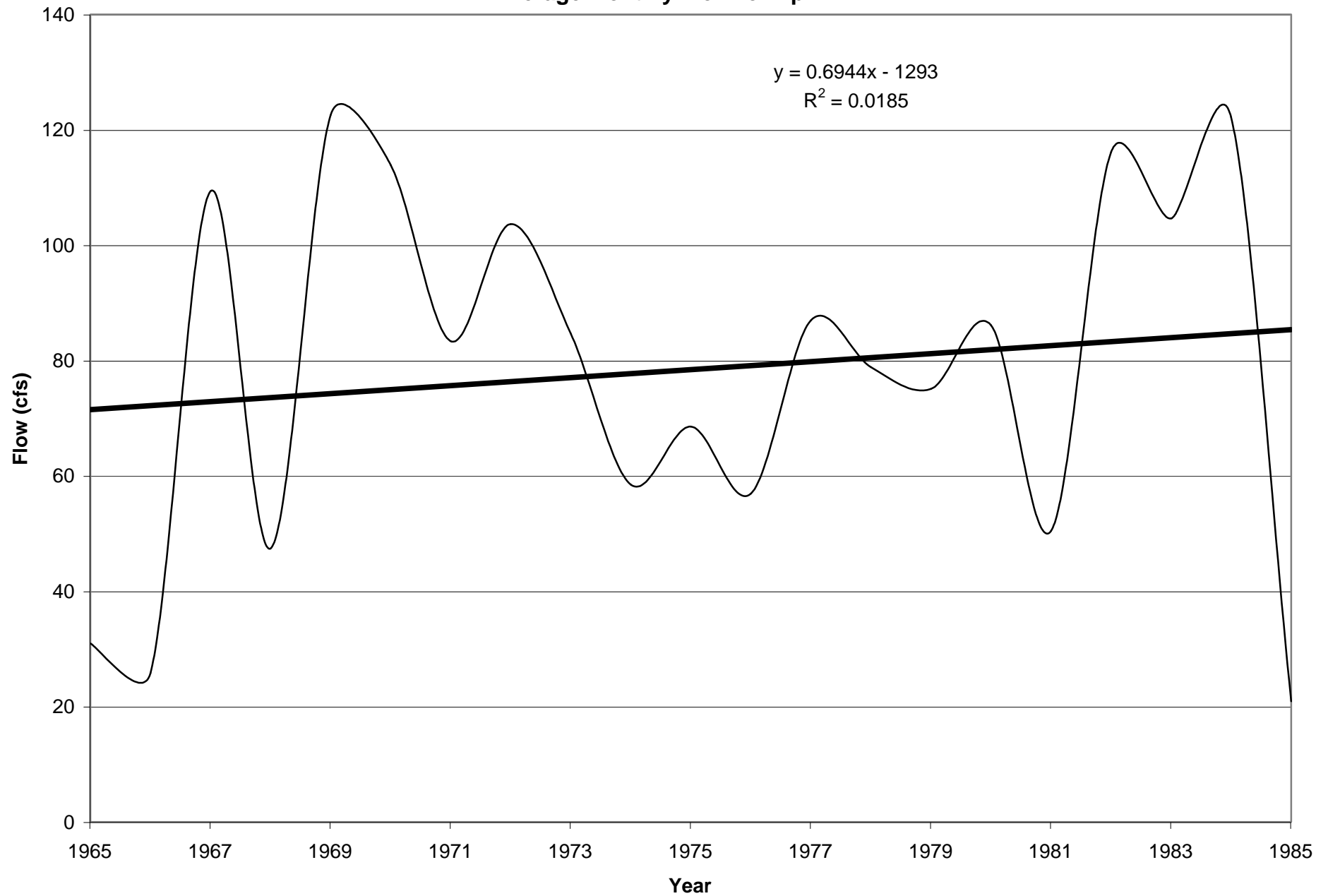
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Average Monthly Flow for February**



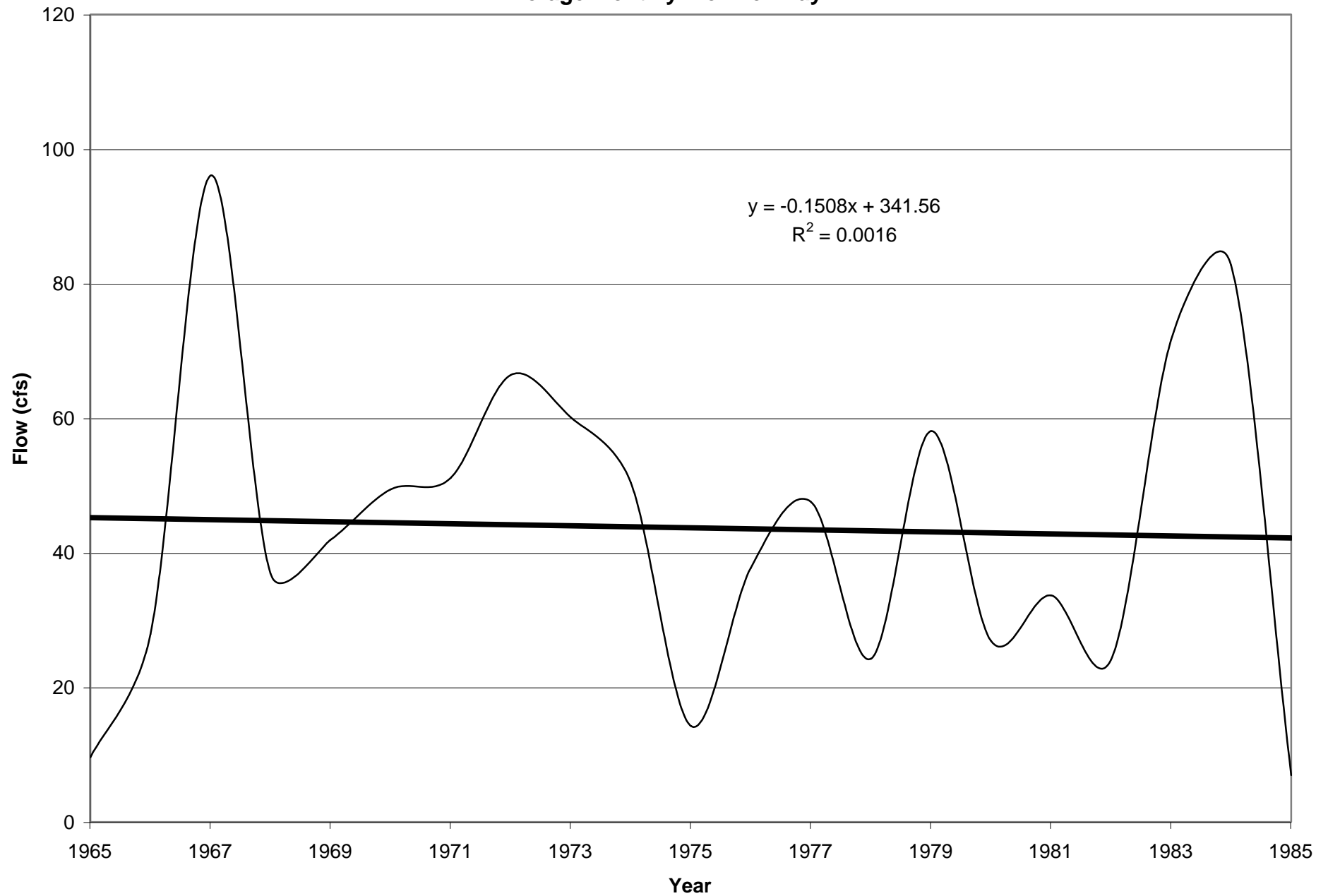
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Average Monthly Flow for March**



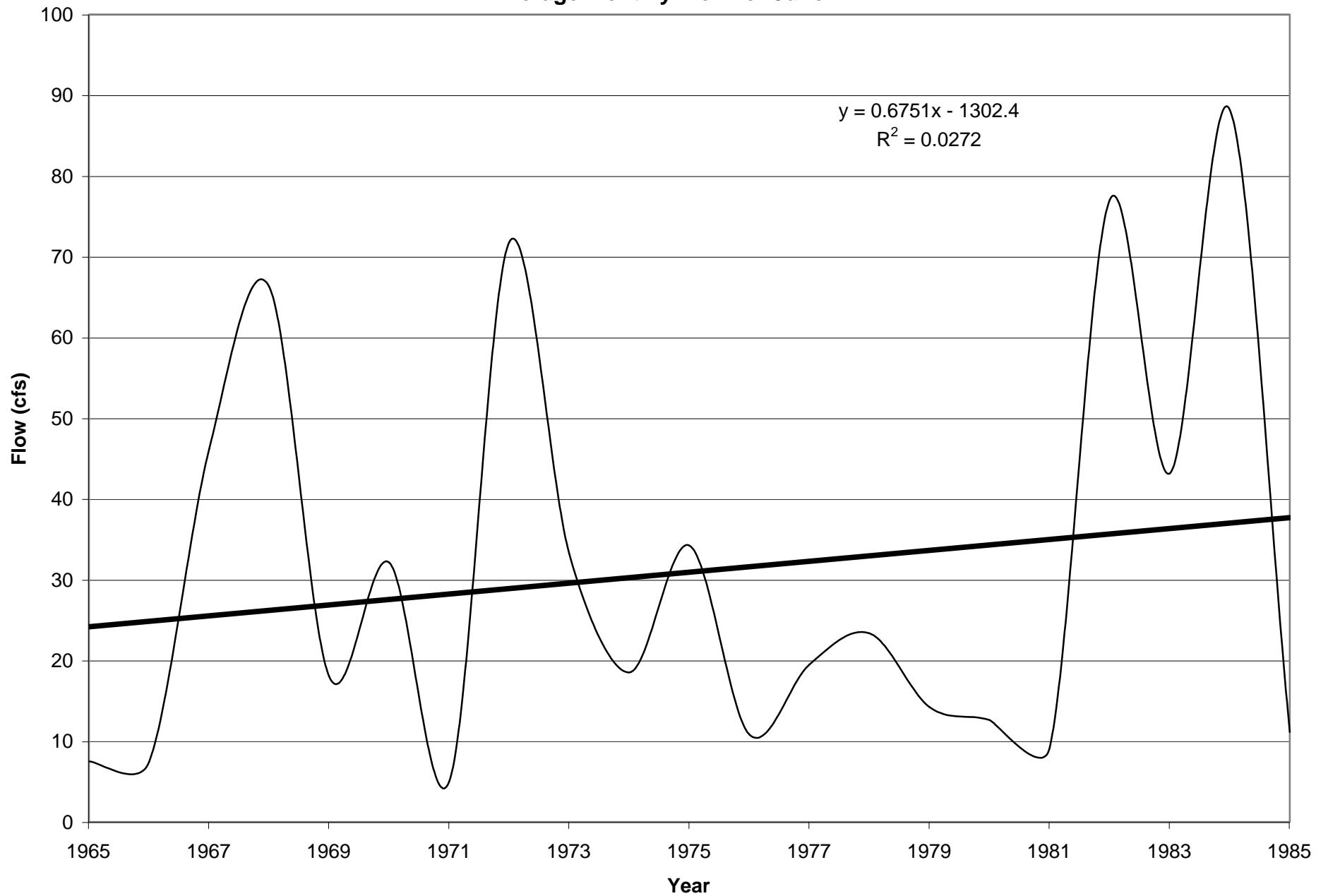
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Average Monthly Flow for April**



**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Average Monthly Flow for May**

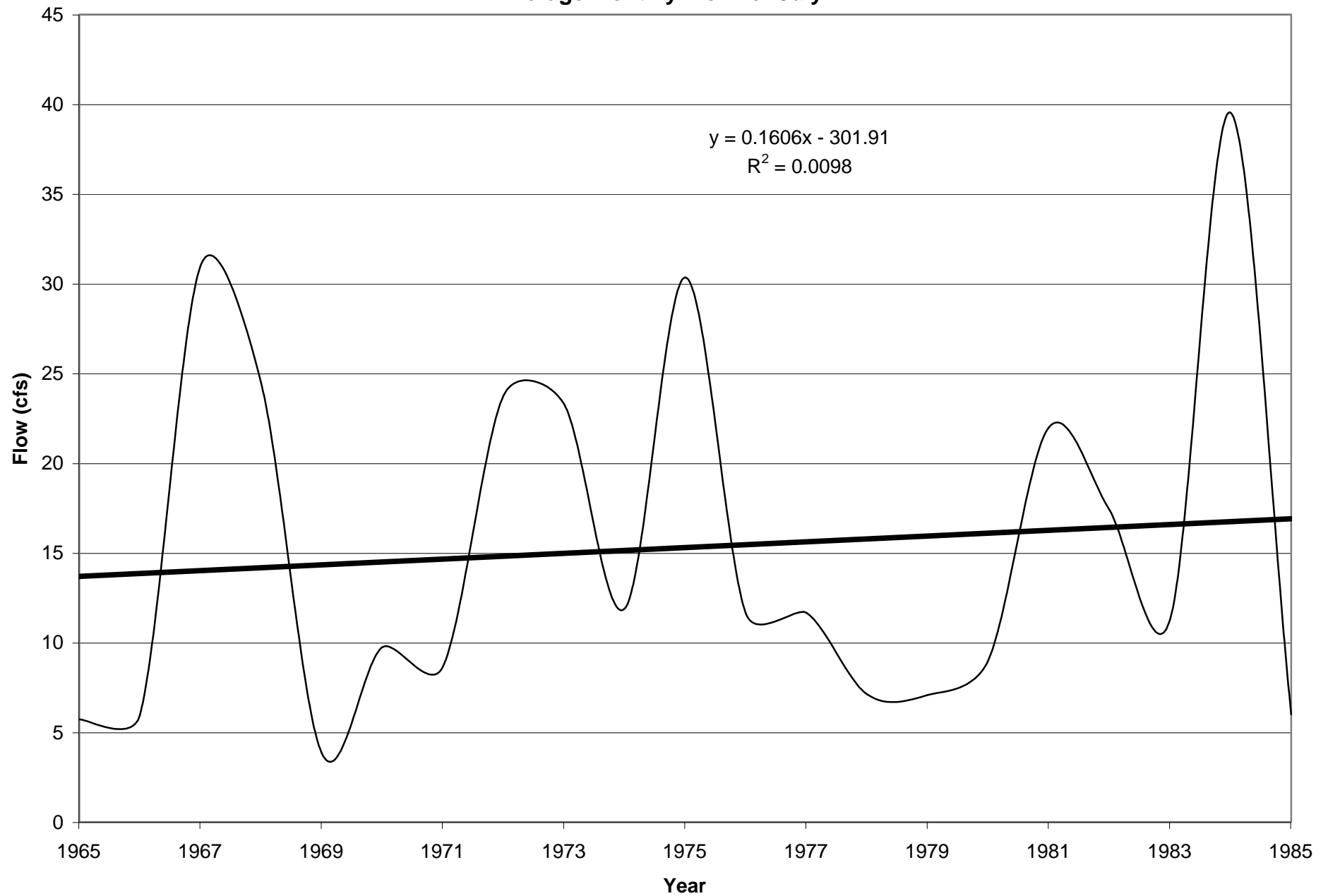


**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Average Monthly Flow for June**

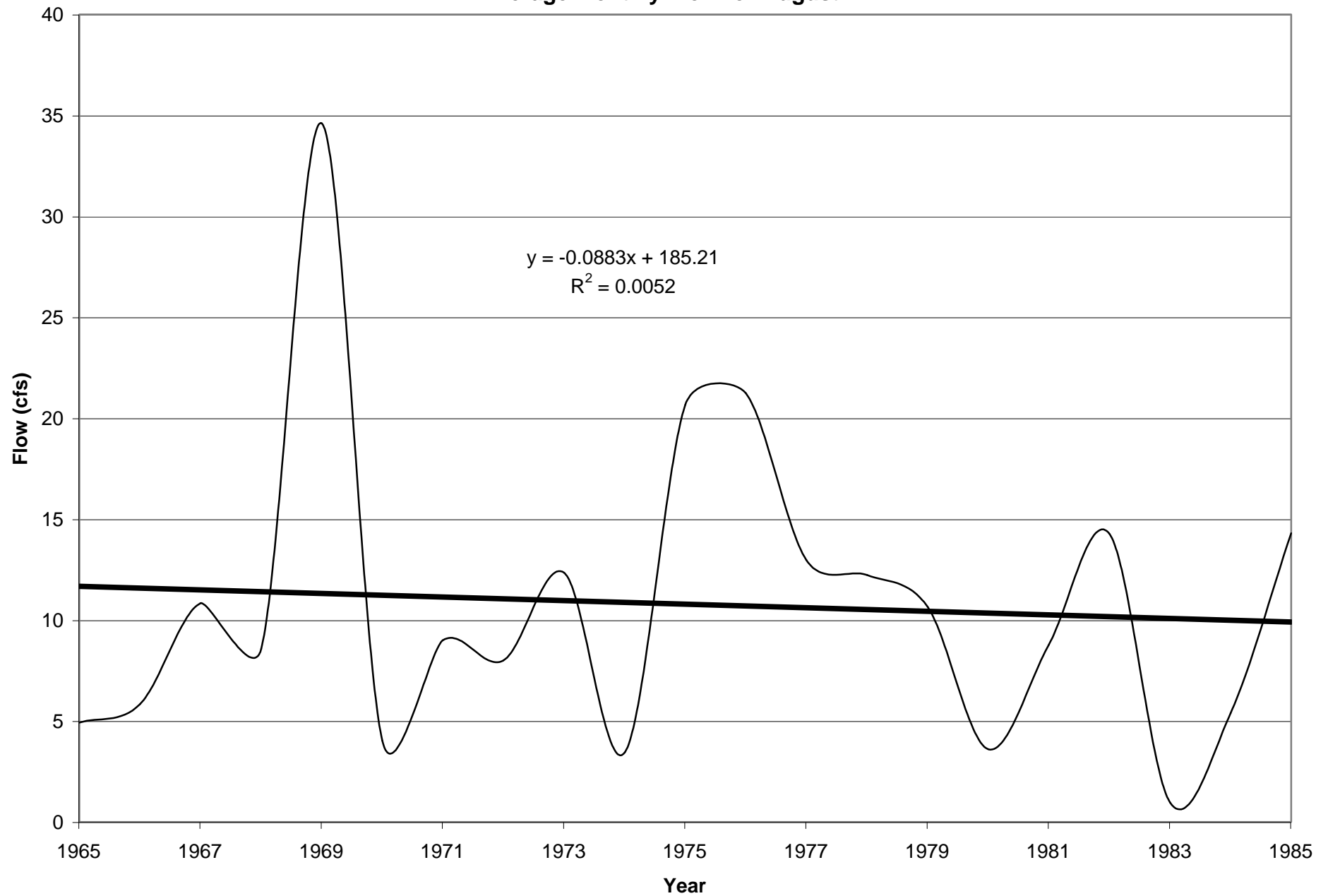




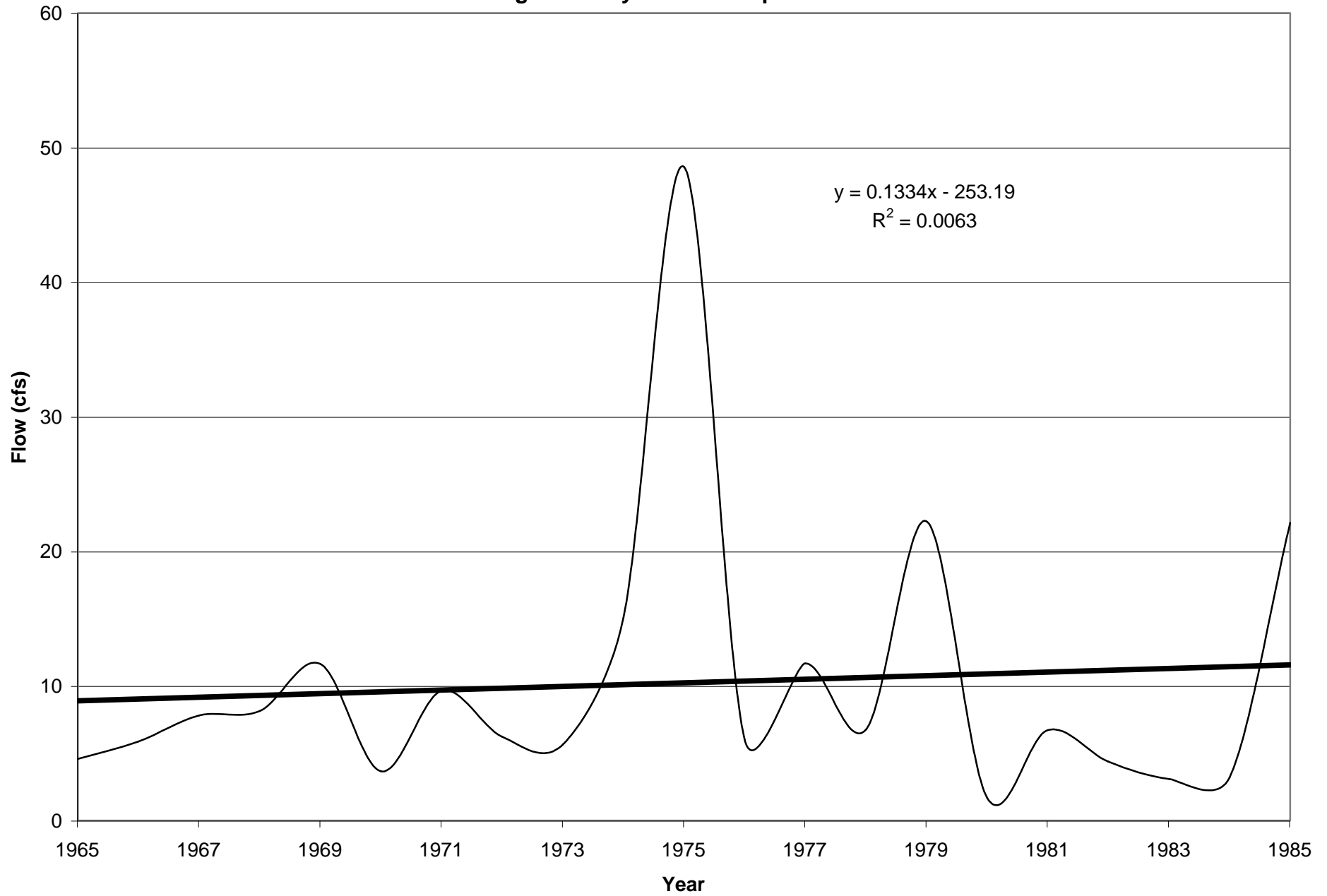
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Average Monthly Flow for July**



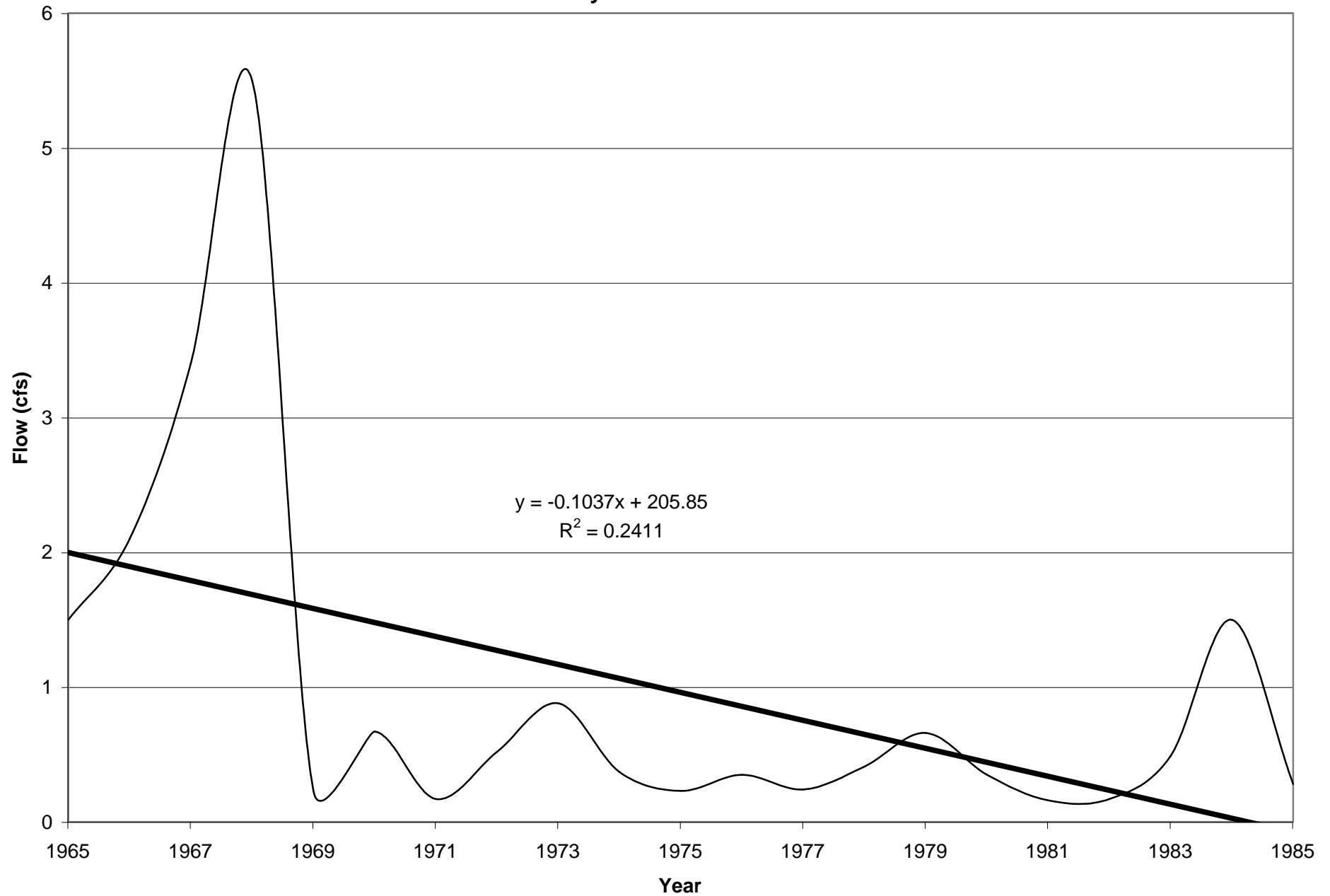
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Average Monthly Flow for August**



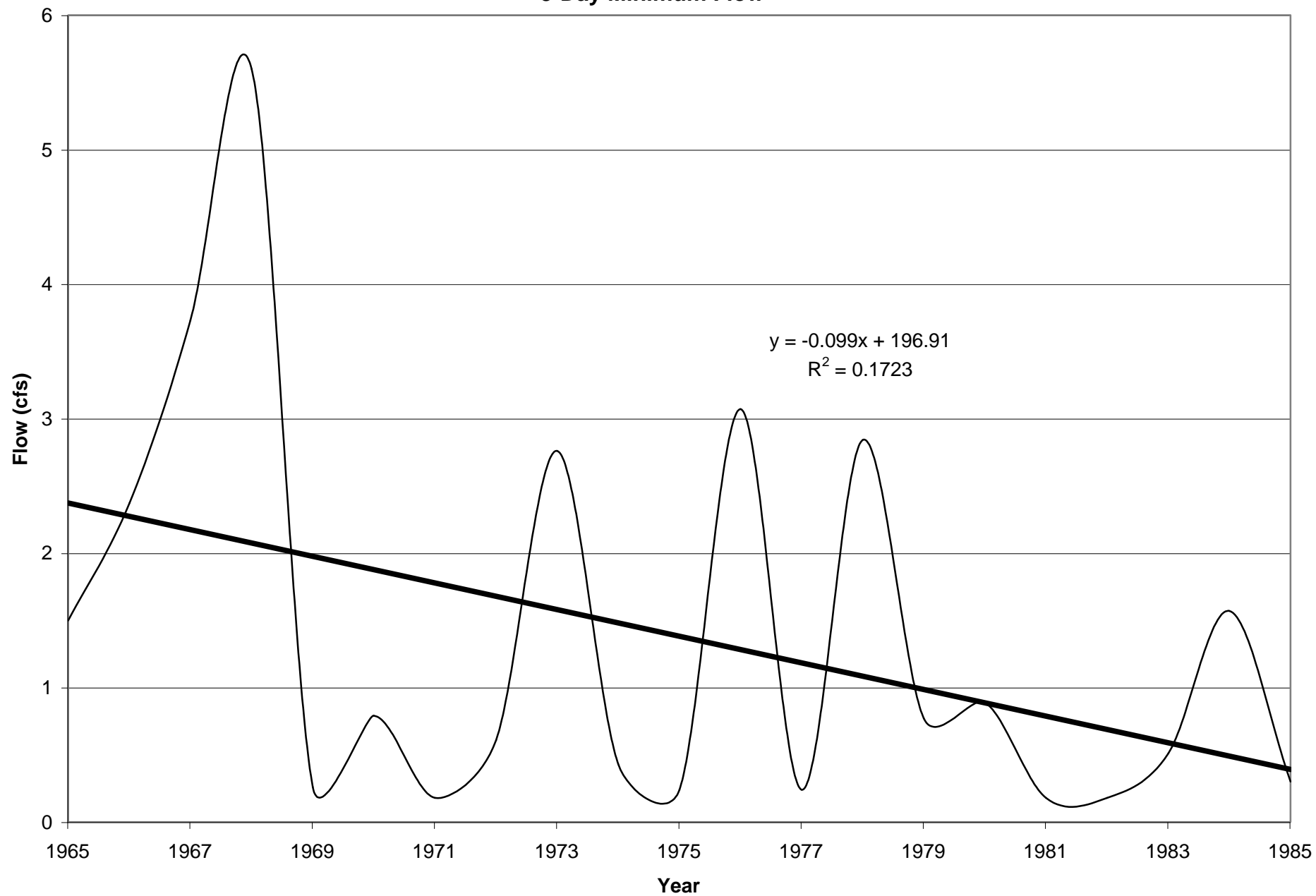
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Average Monthly Flow for September**



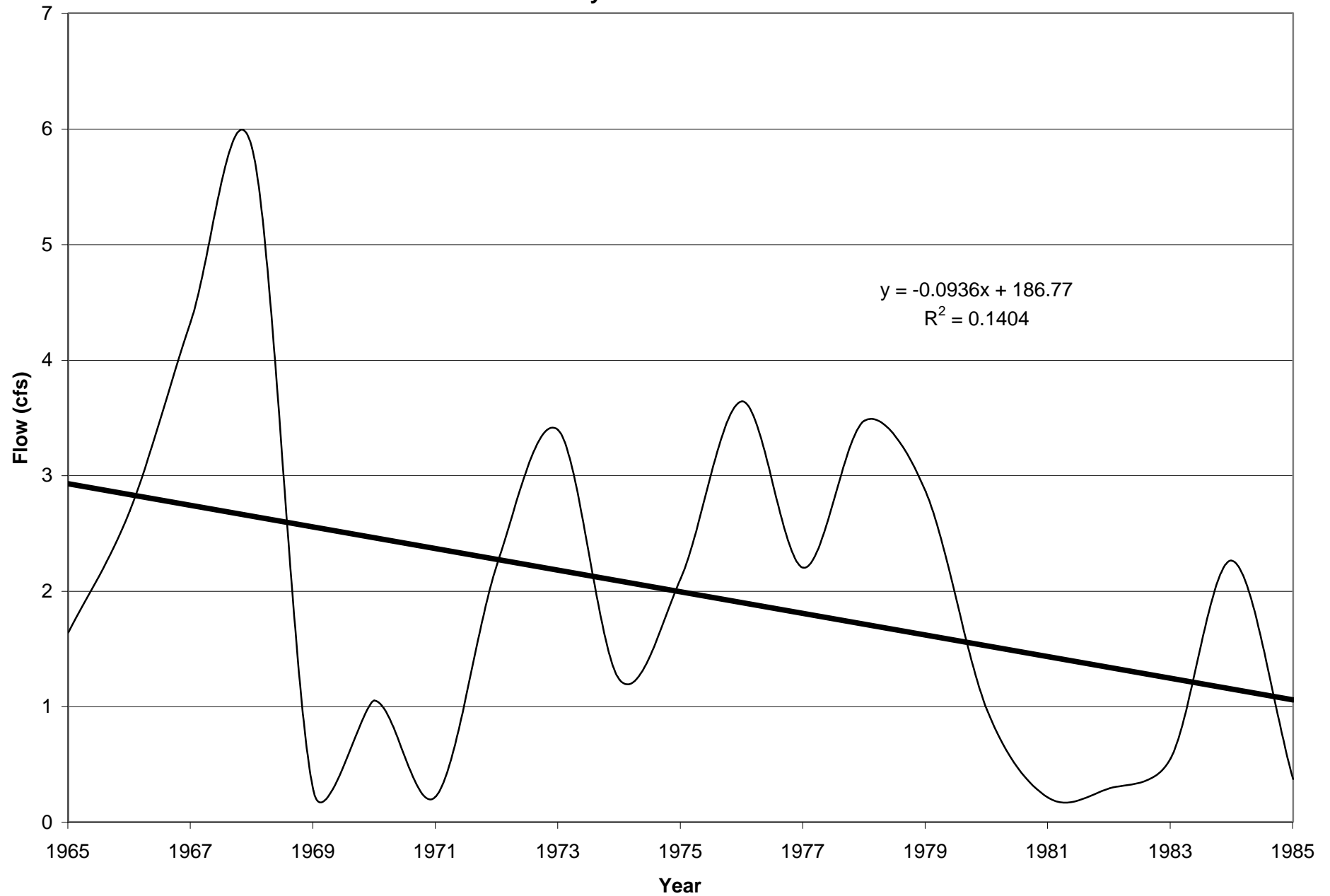
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**1-Day Minimum Flow**



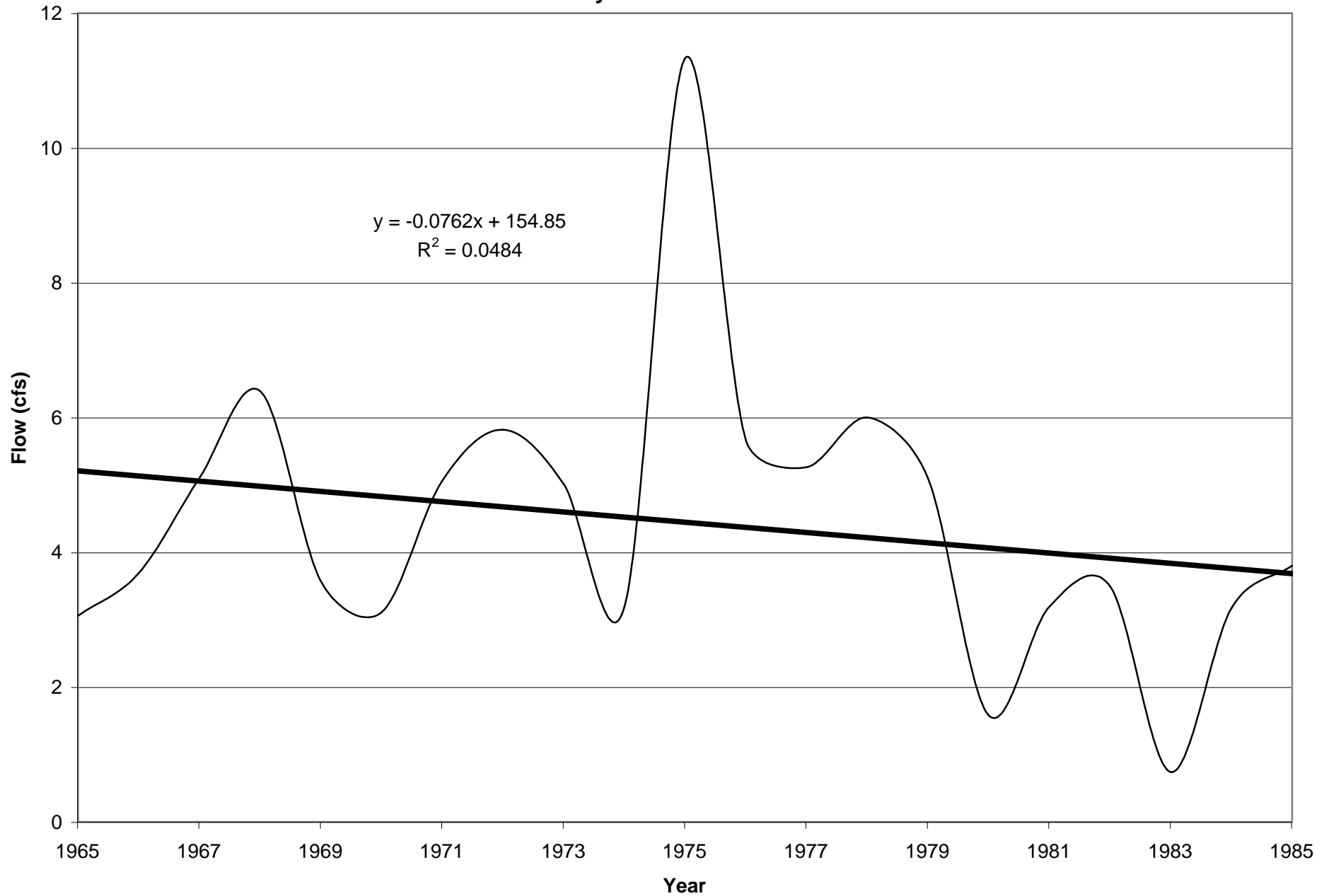
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**3-Day Minimum Flow**



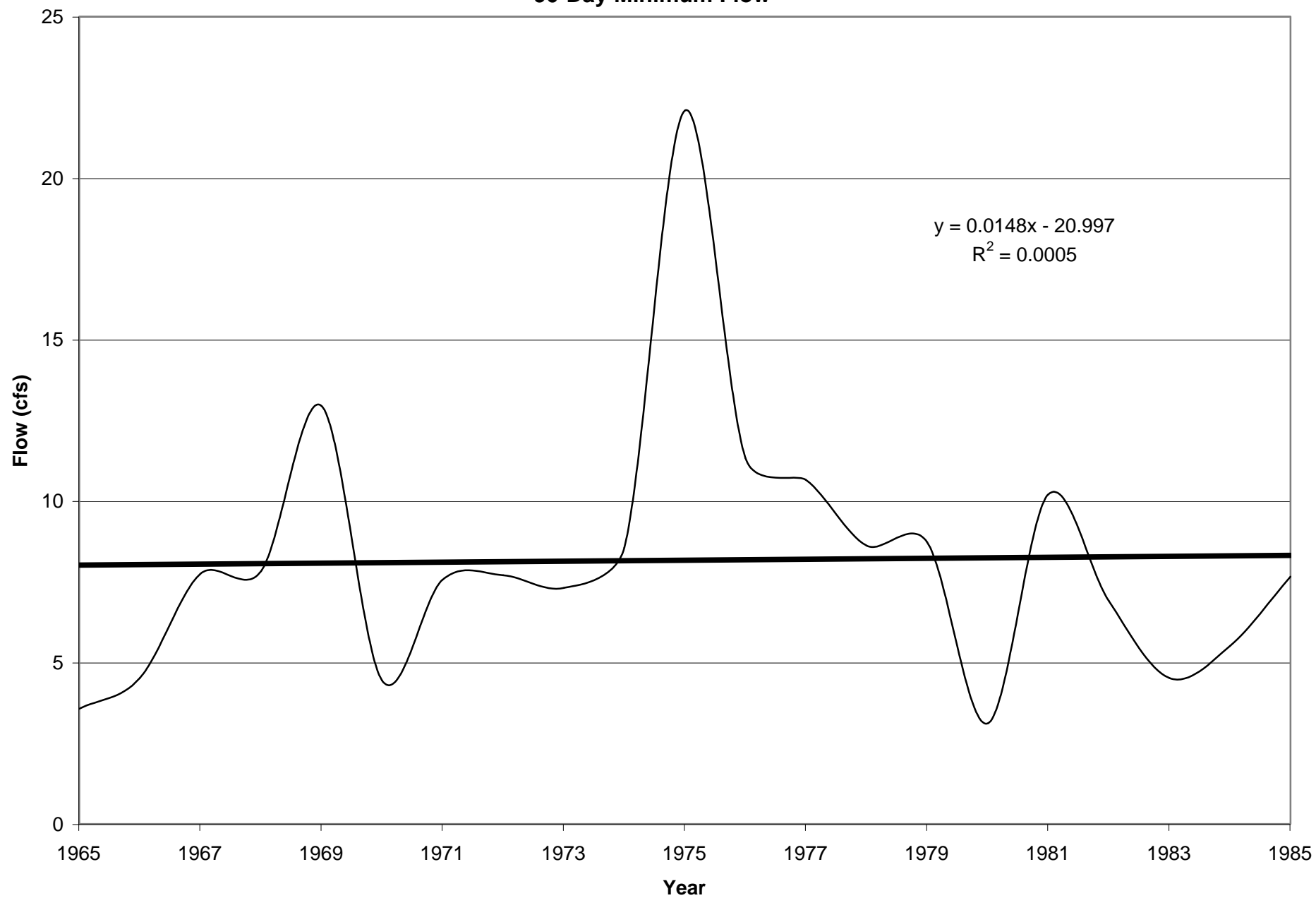
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**7-Day Minimum Flow**



**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**30-Day Minimum Flow**

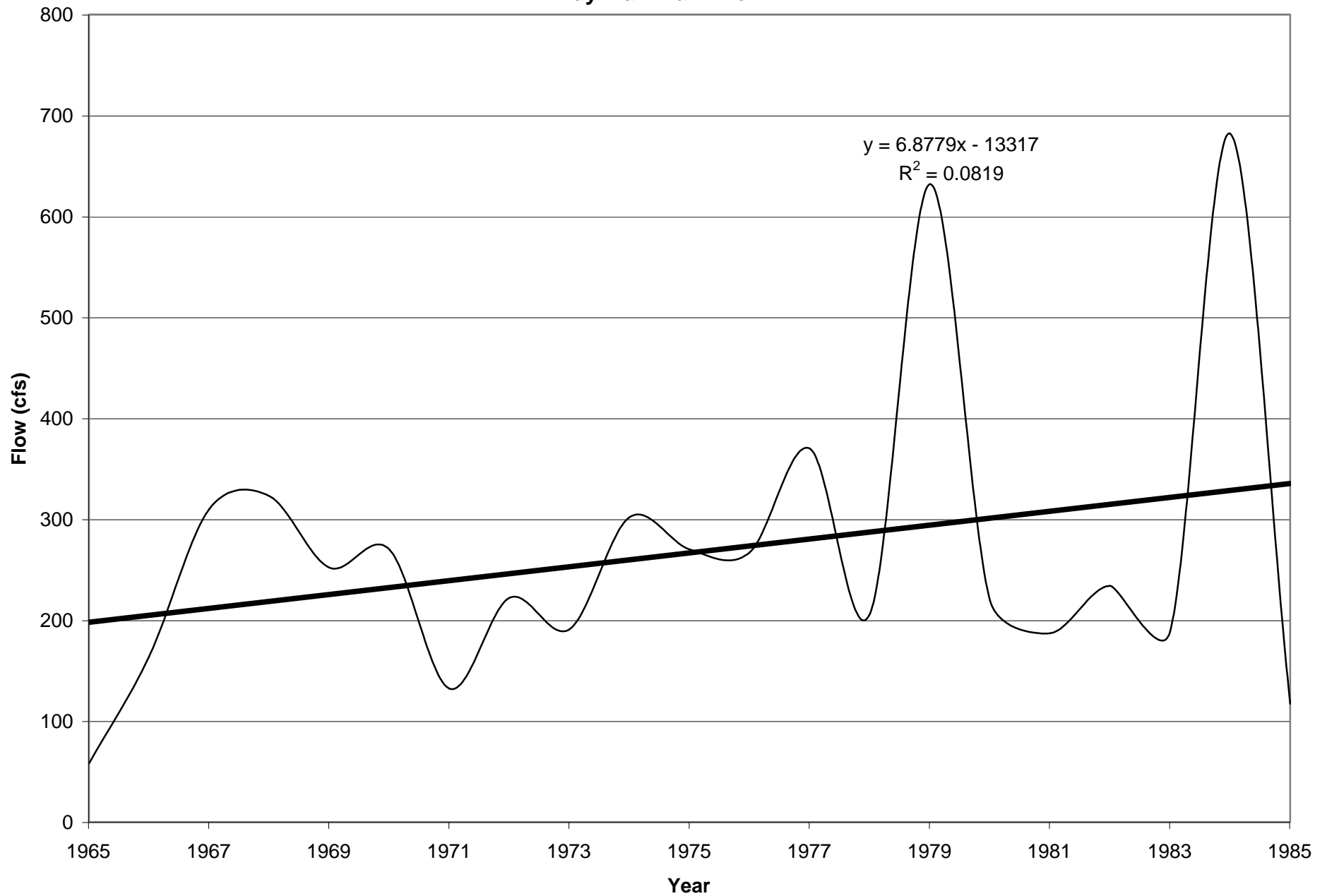


**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**90-Day Minimum Flow**

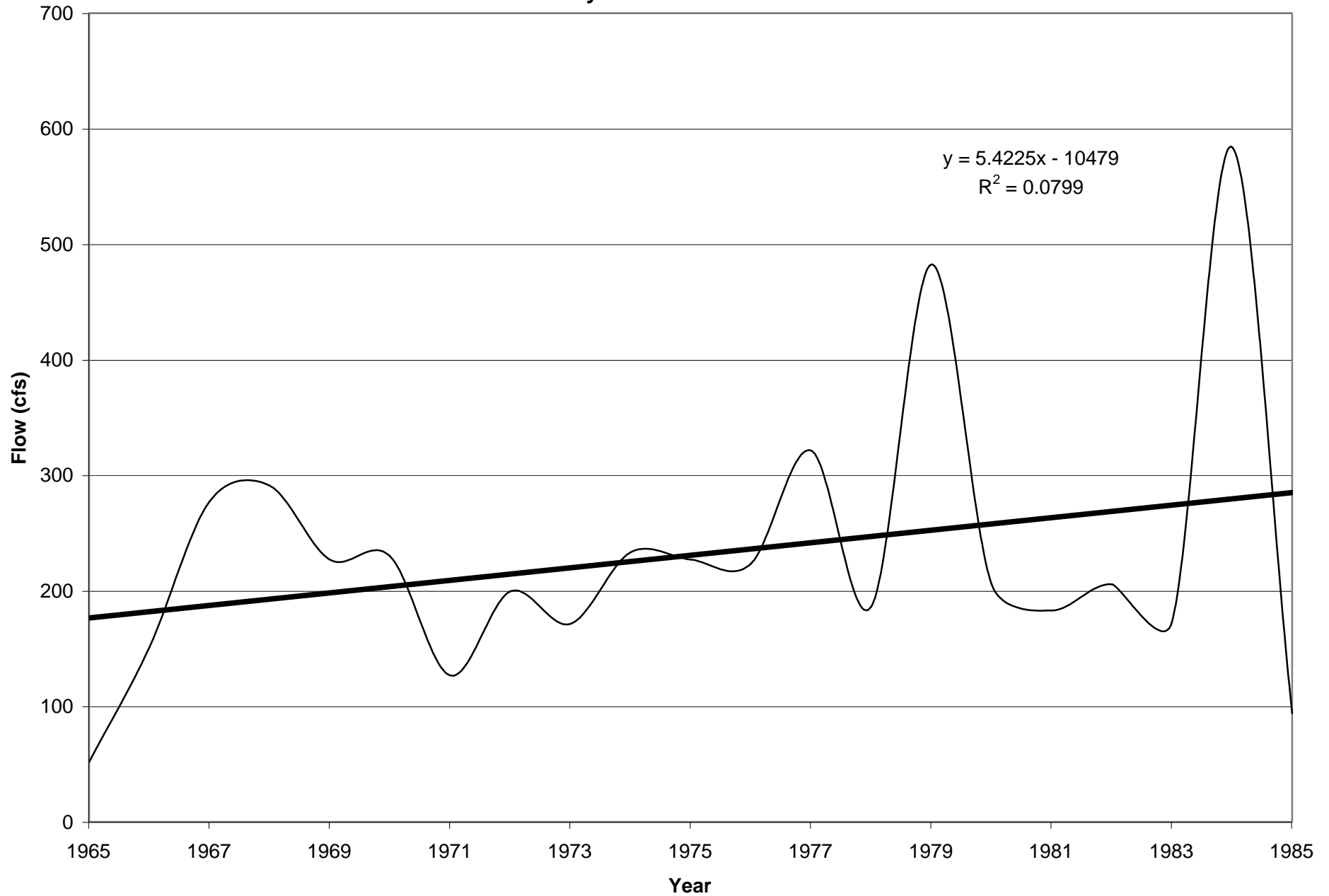




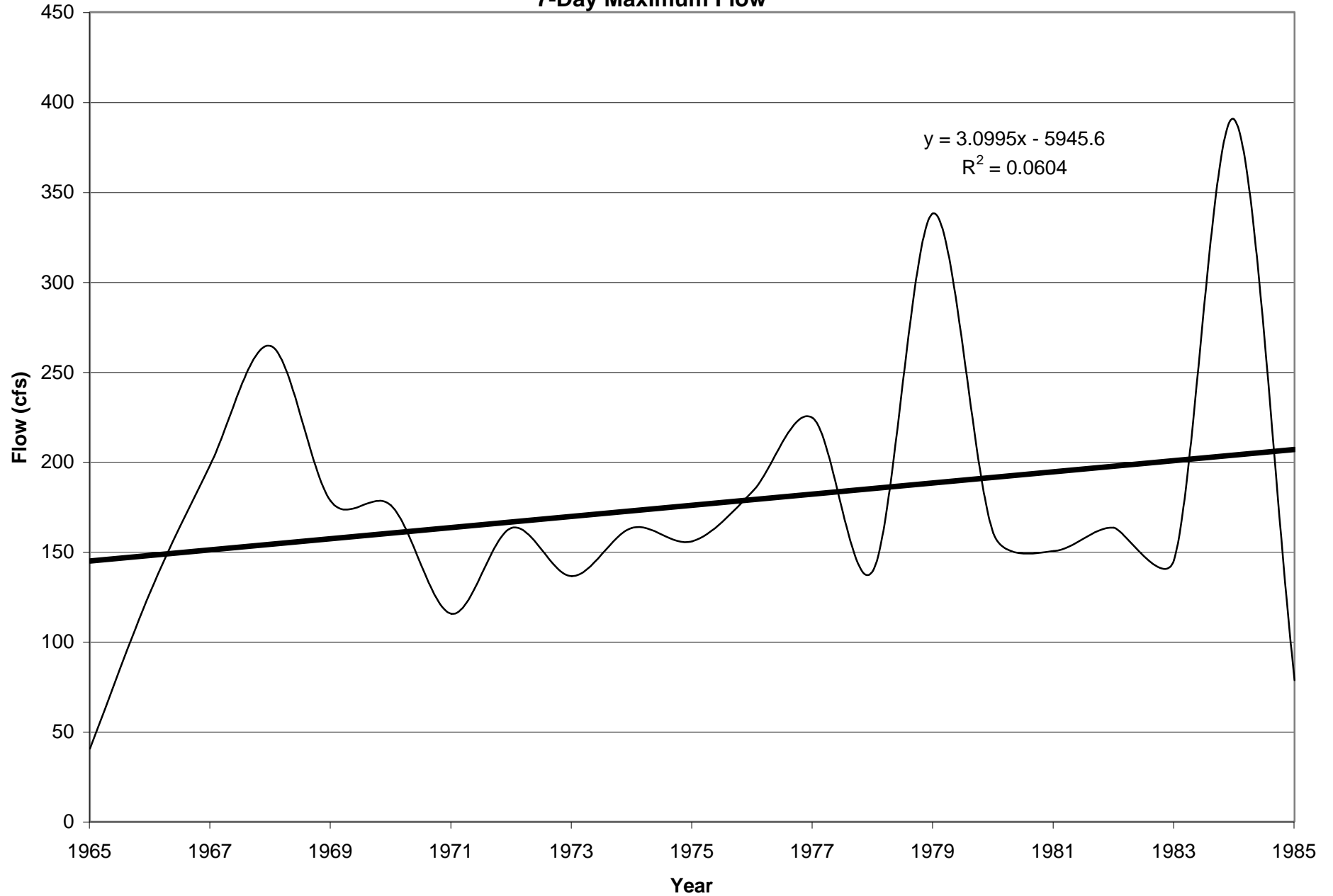
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**1-Day Maximum Flow**



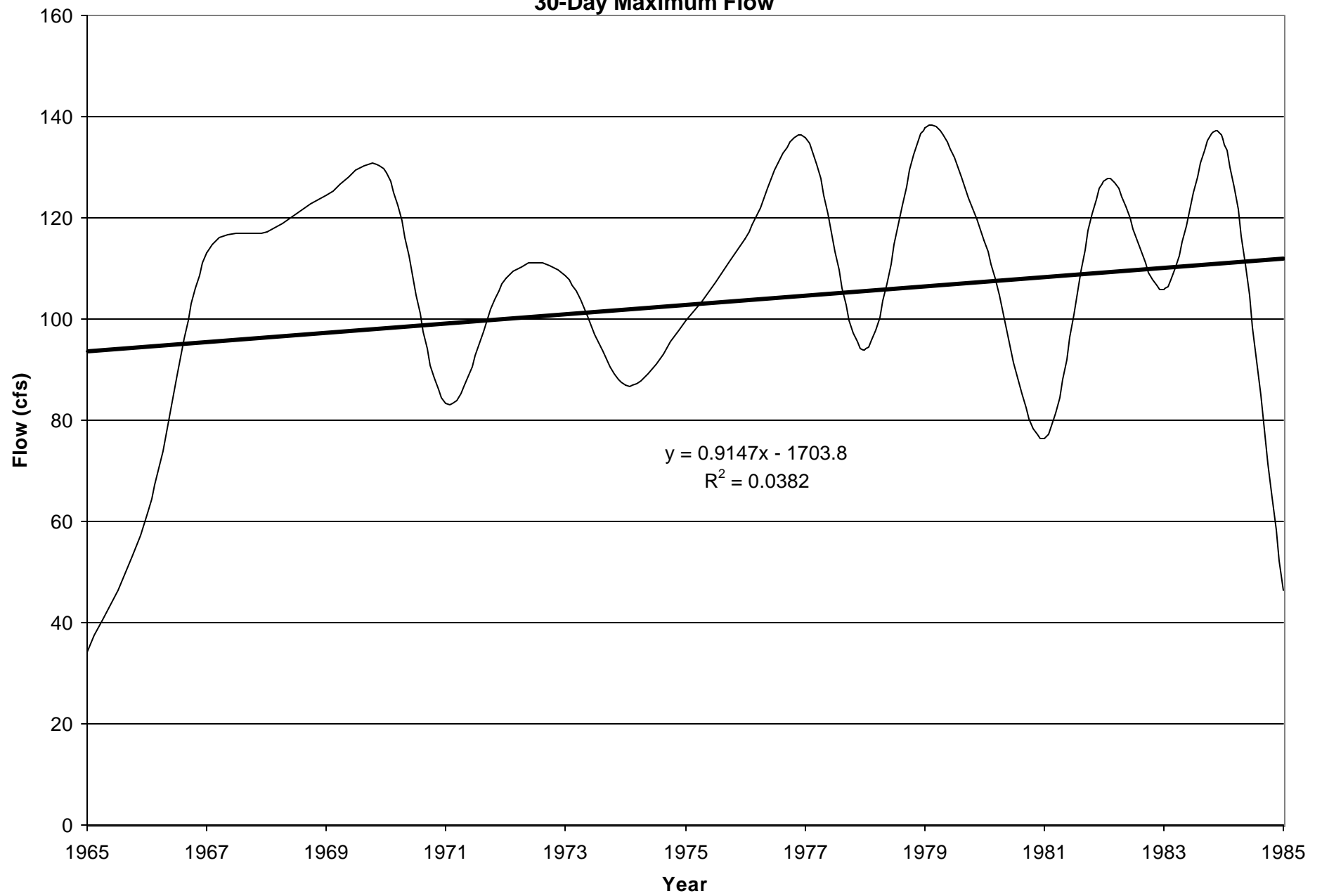
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**3-Day Maximum Flow**



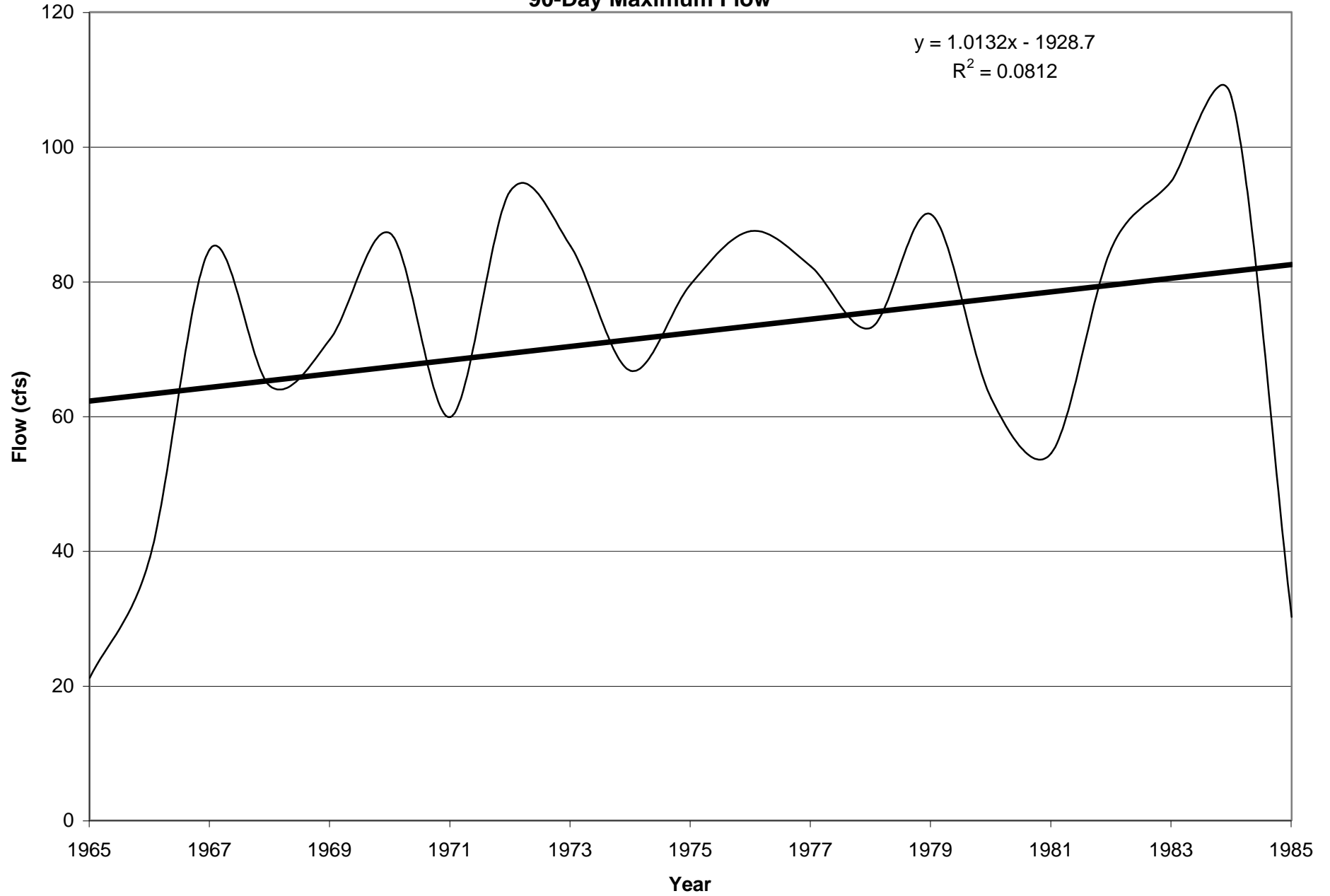
Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi  
7-Day Maximum Flow



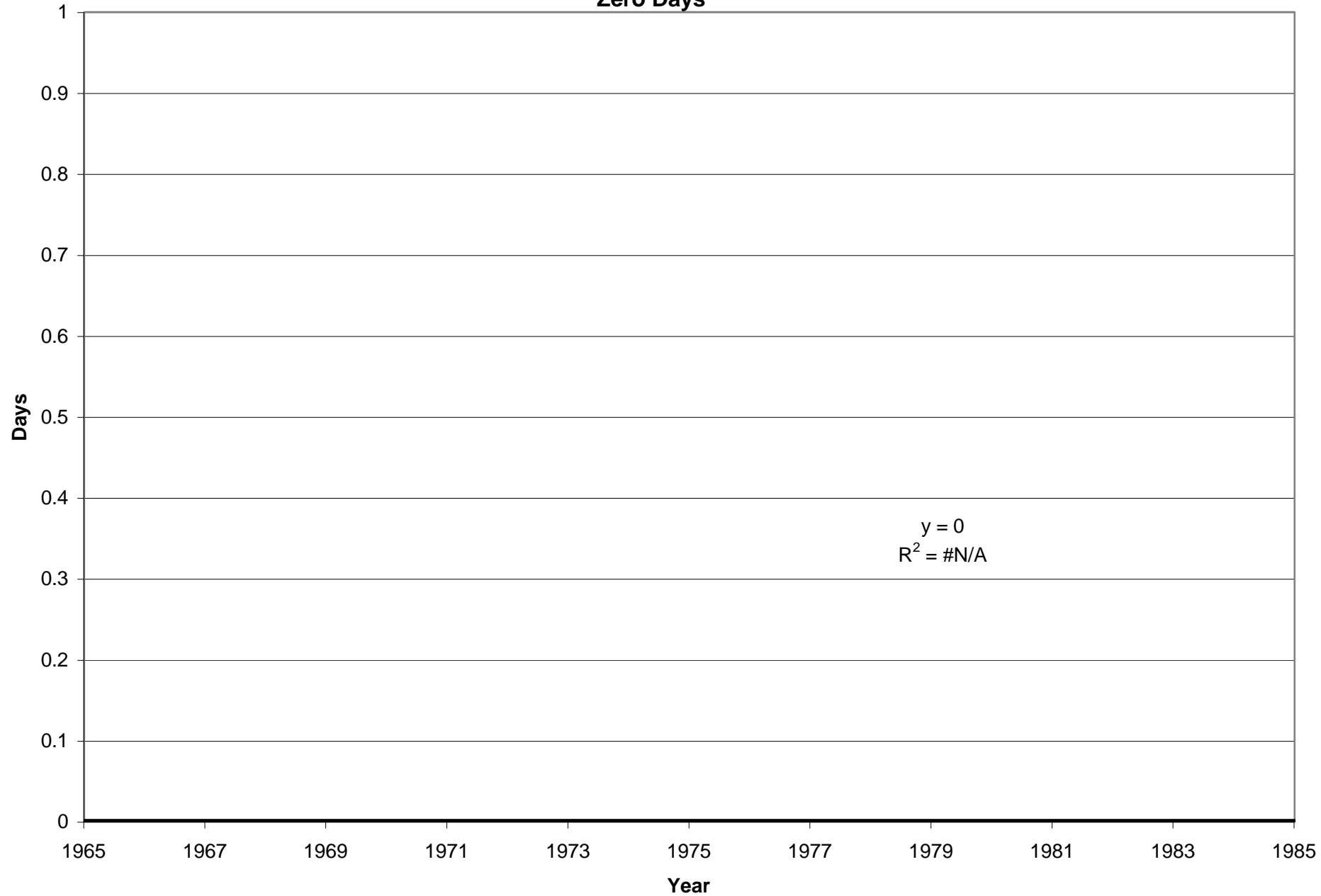
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**30-Day Maximum Flow**



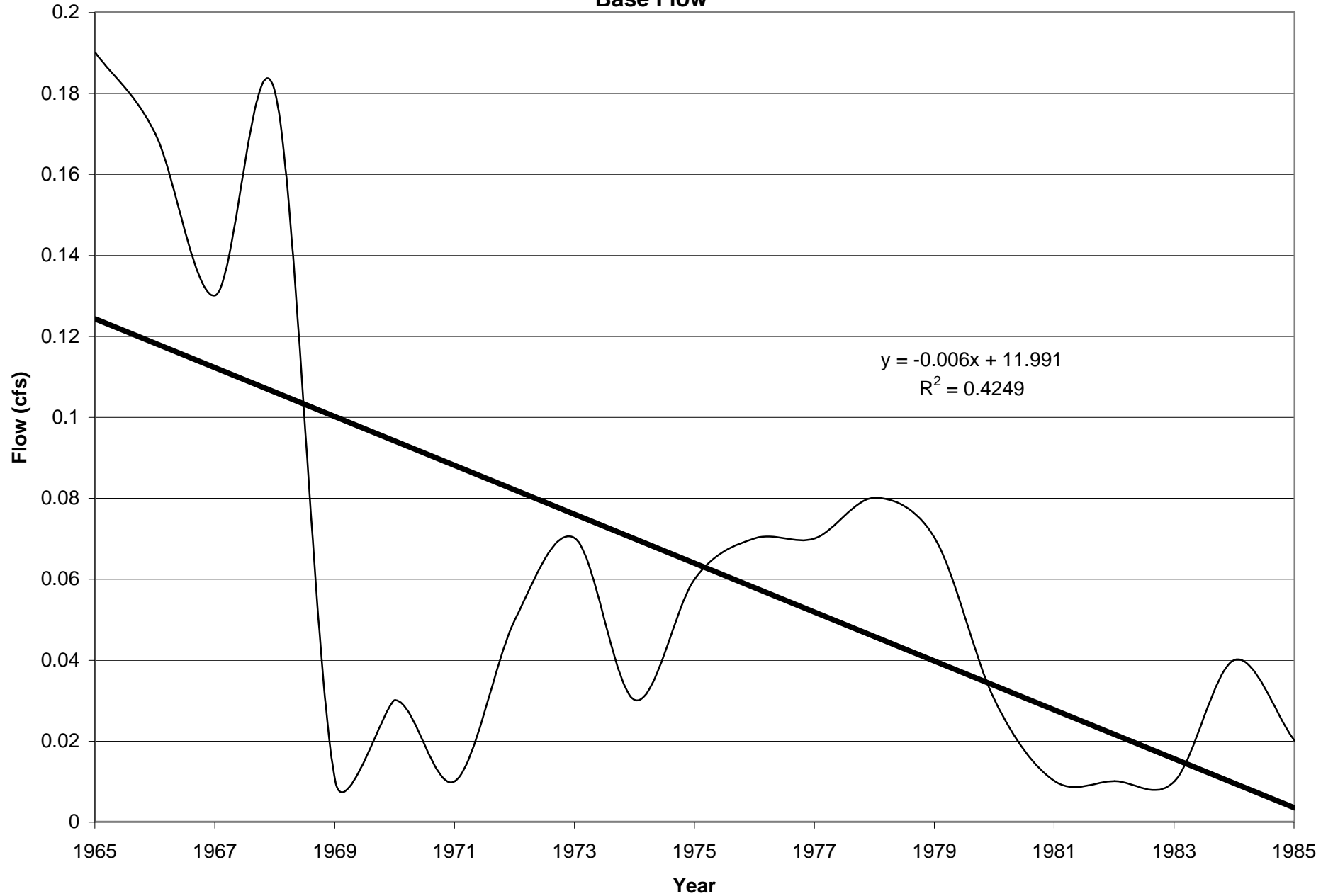
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**90-Day Maximum Flow**



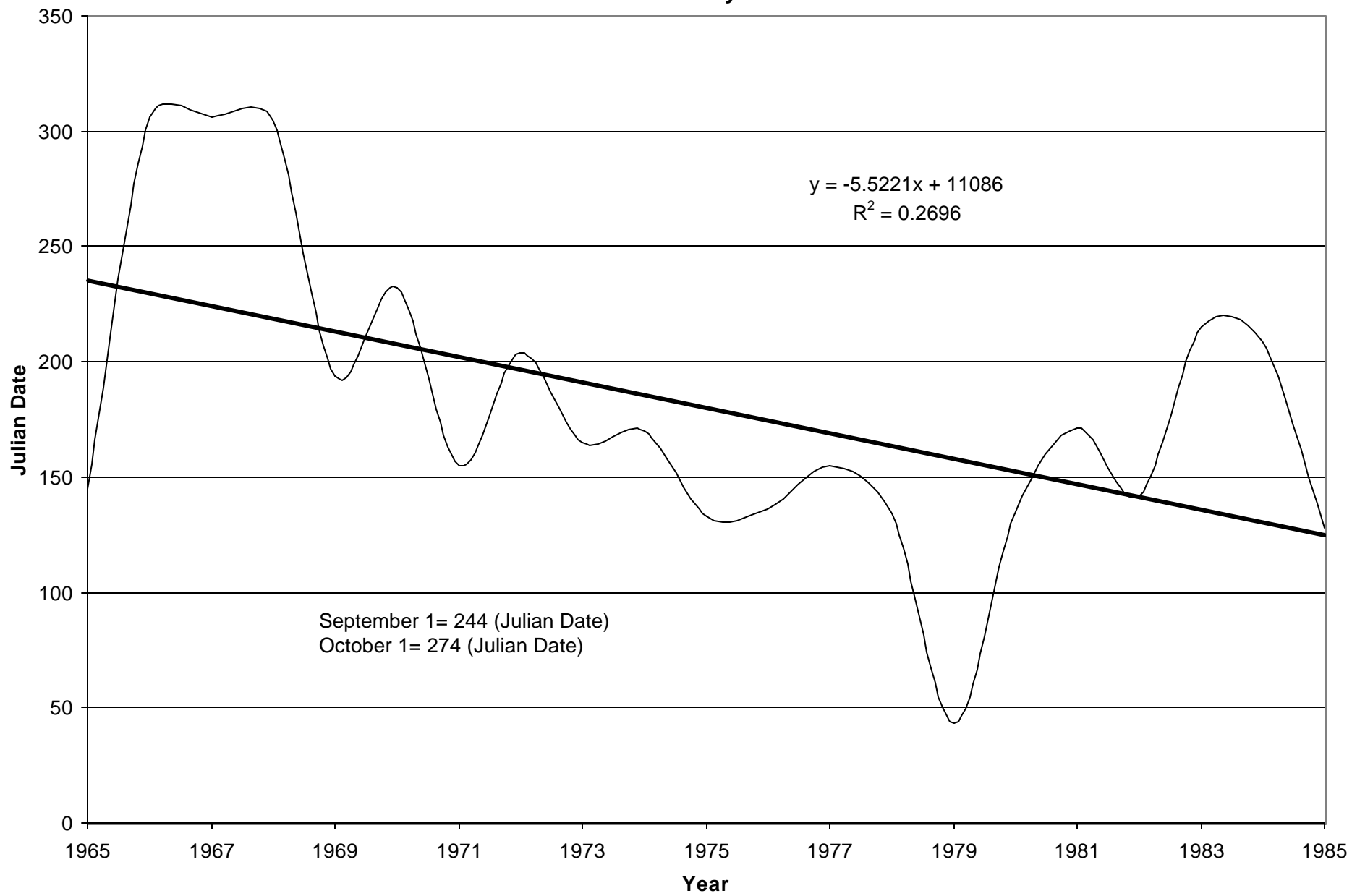
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Zero Days**



**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Base Flow**

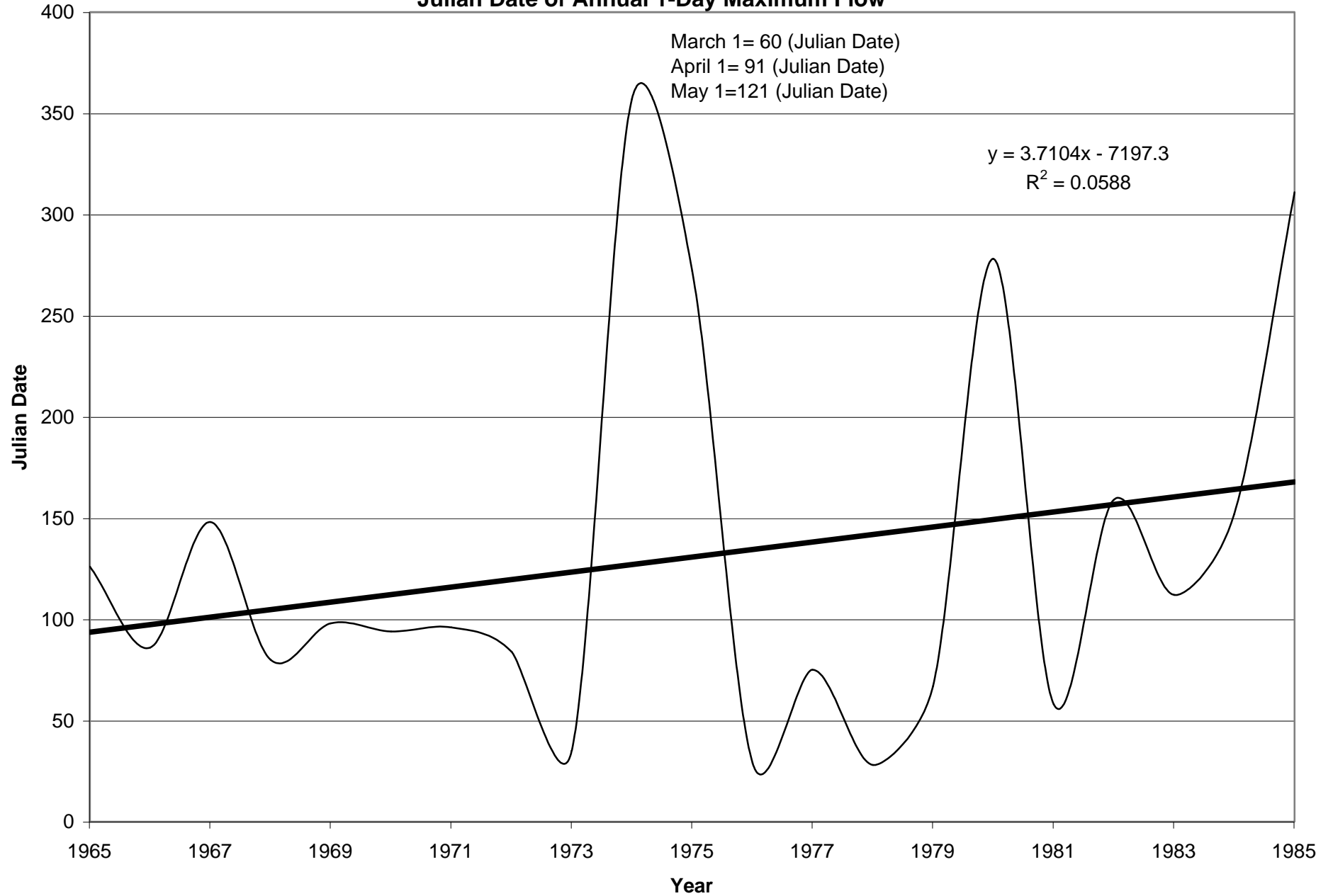


**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Julian Date of Annual 1-Day Minimum Flow**

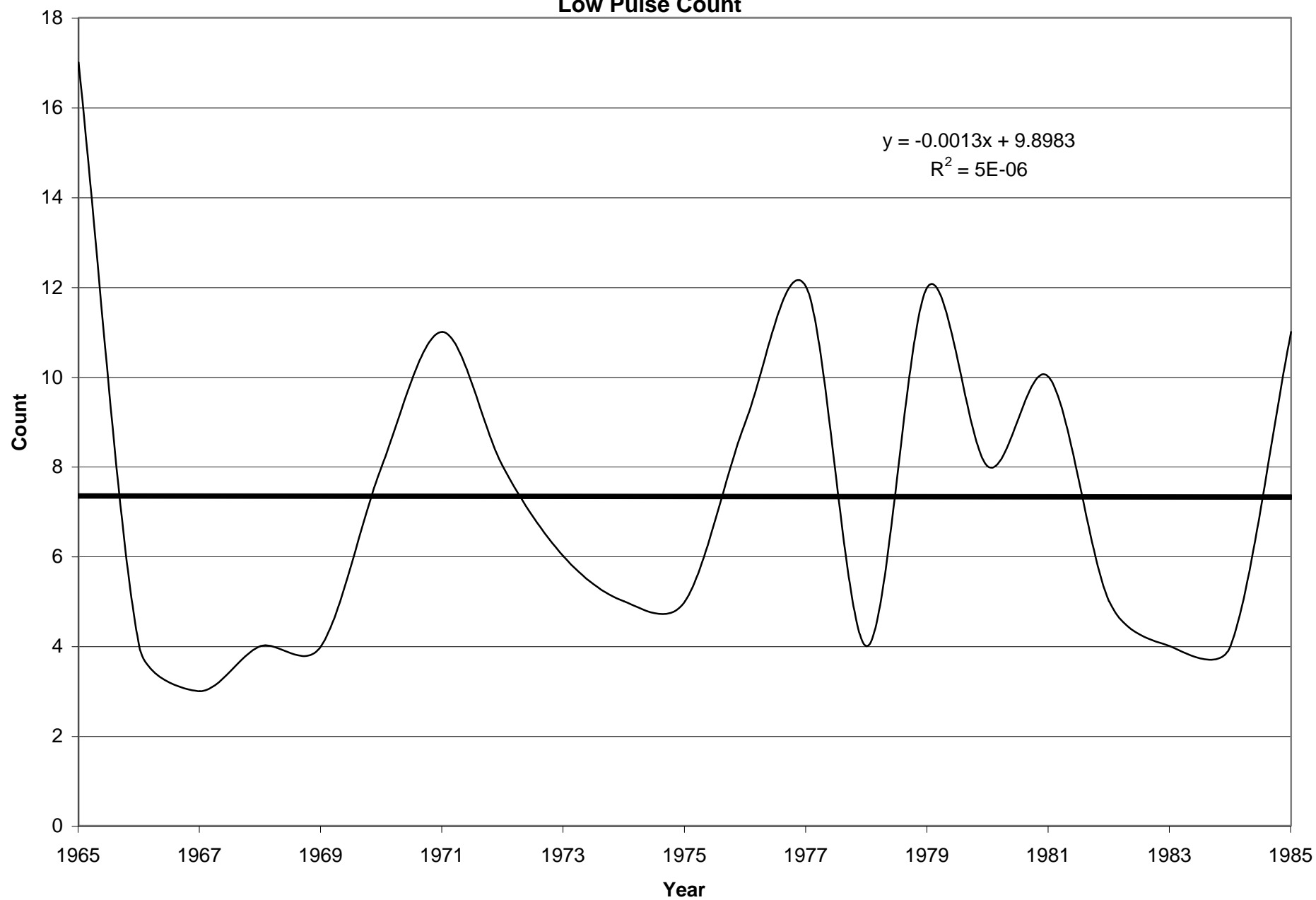




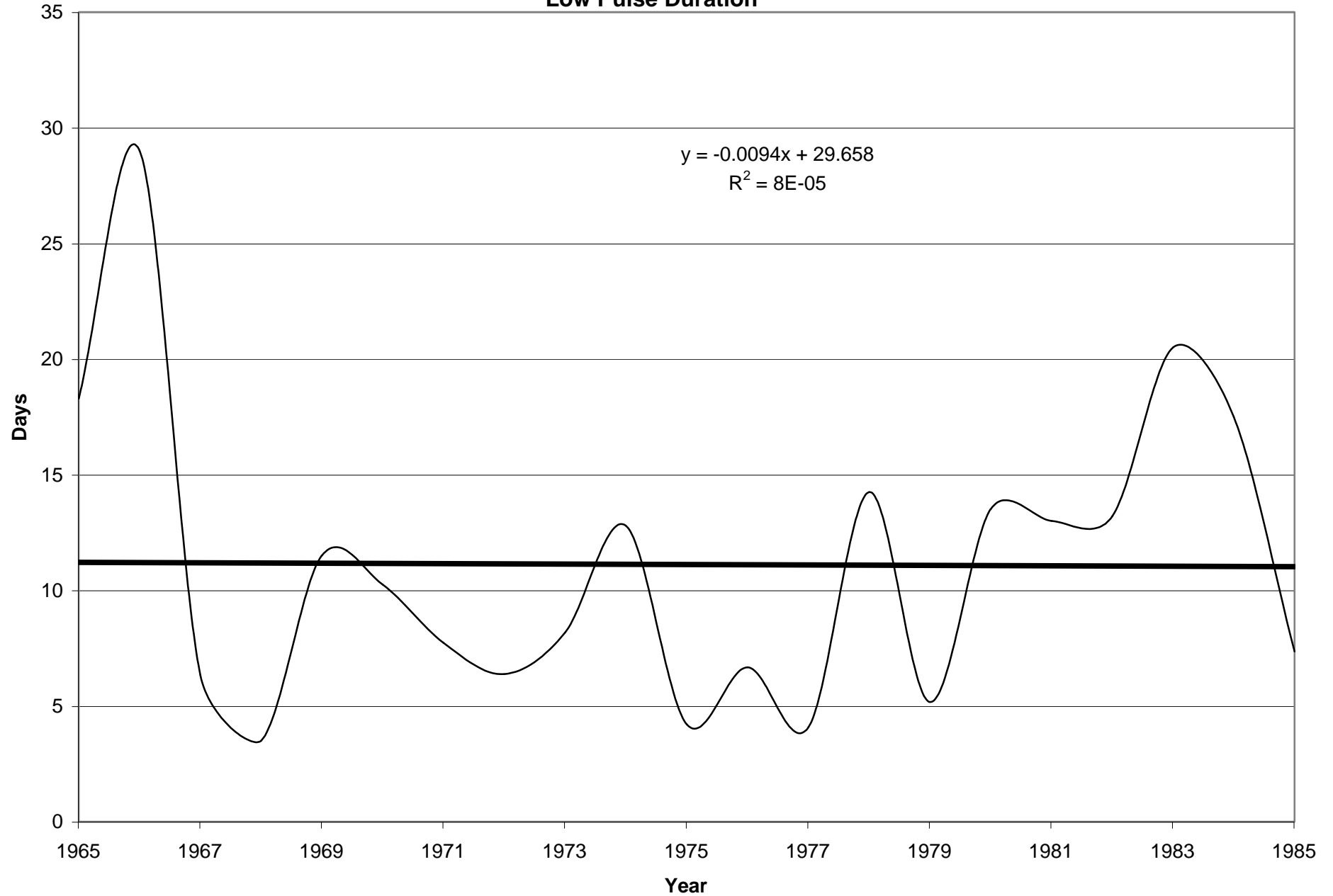
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Julian Date of Annual 1-Day Maximum Flow**



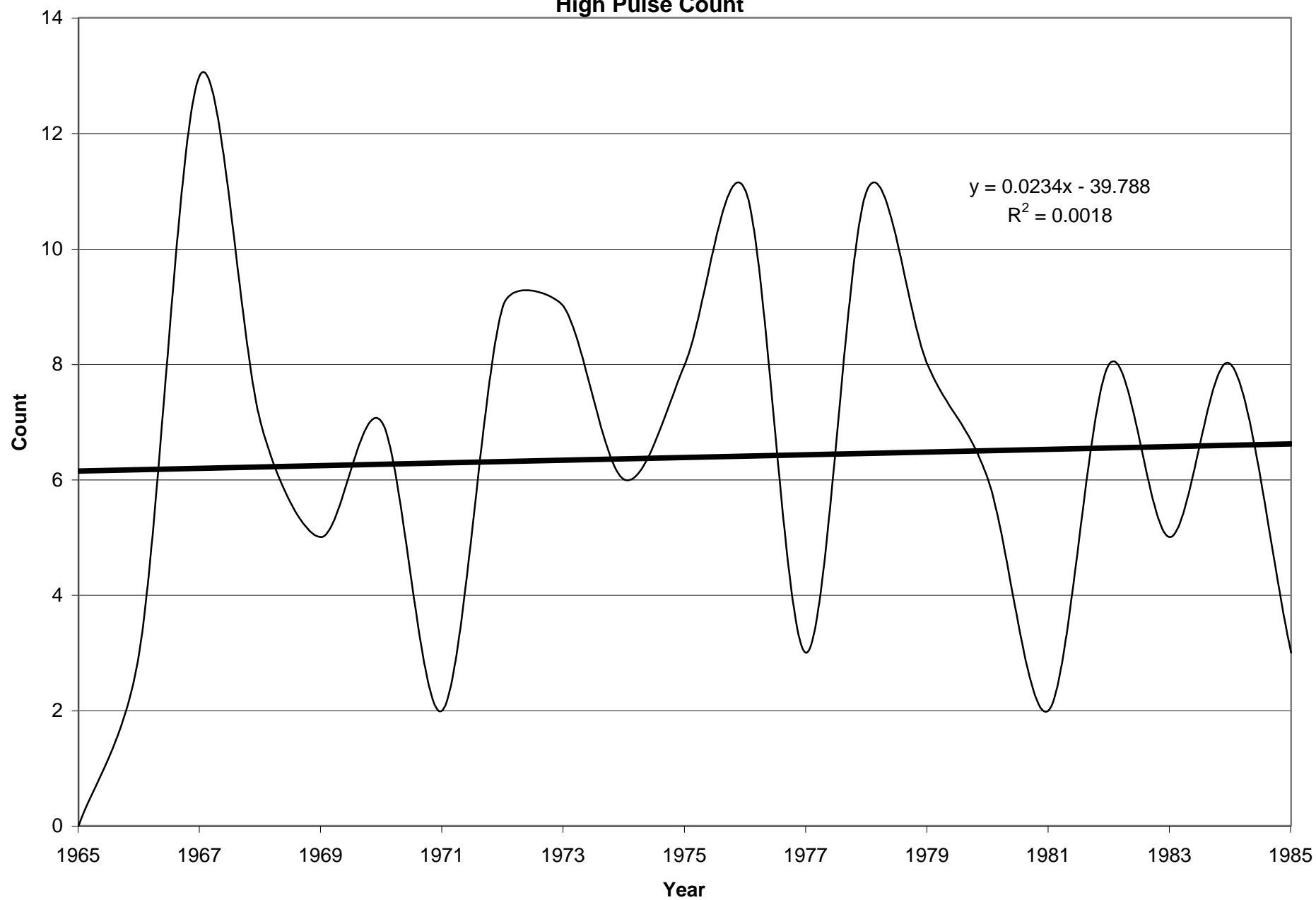
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Low Pulse Count**



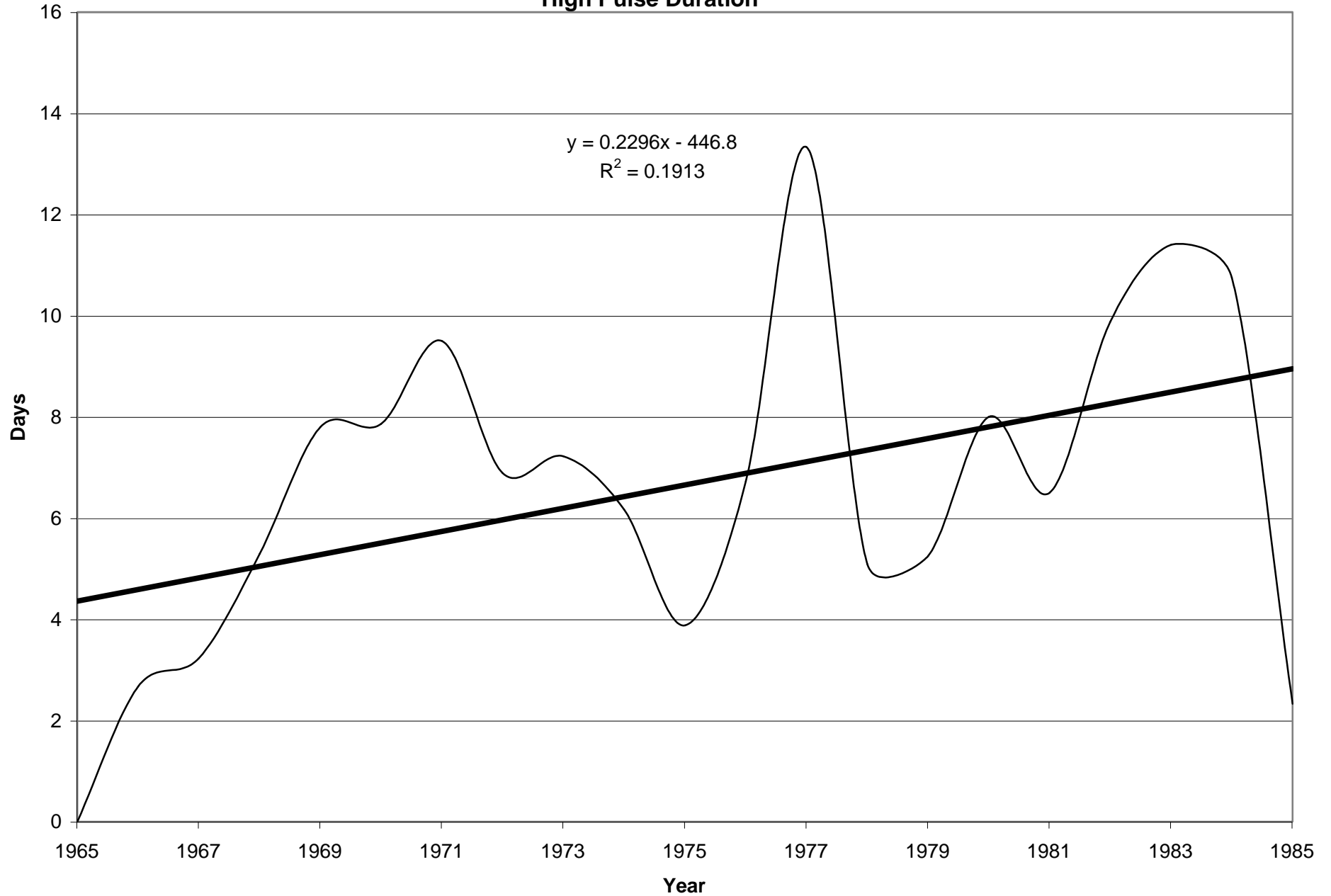
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Low Pulse Duration**



**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**High Pulse Count**



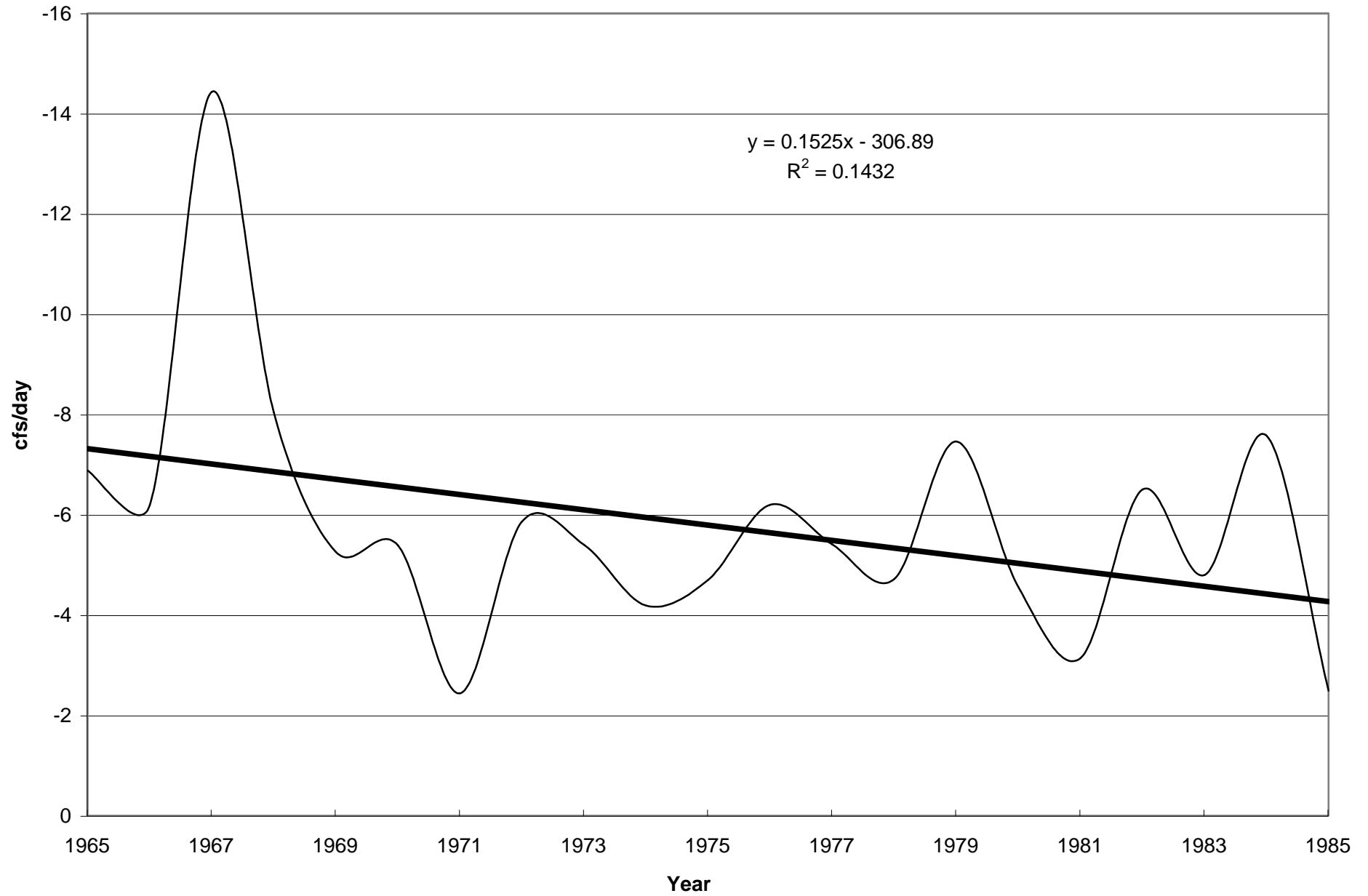
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**High Pulse Duration**



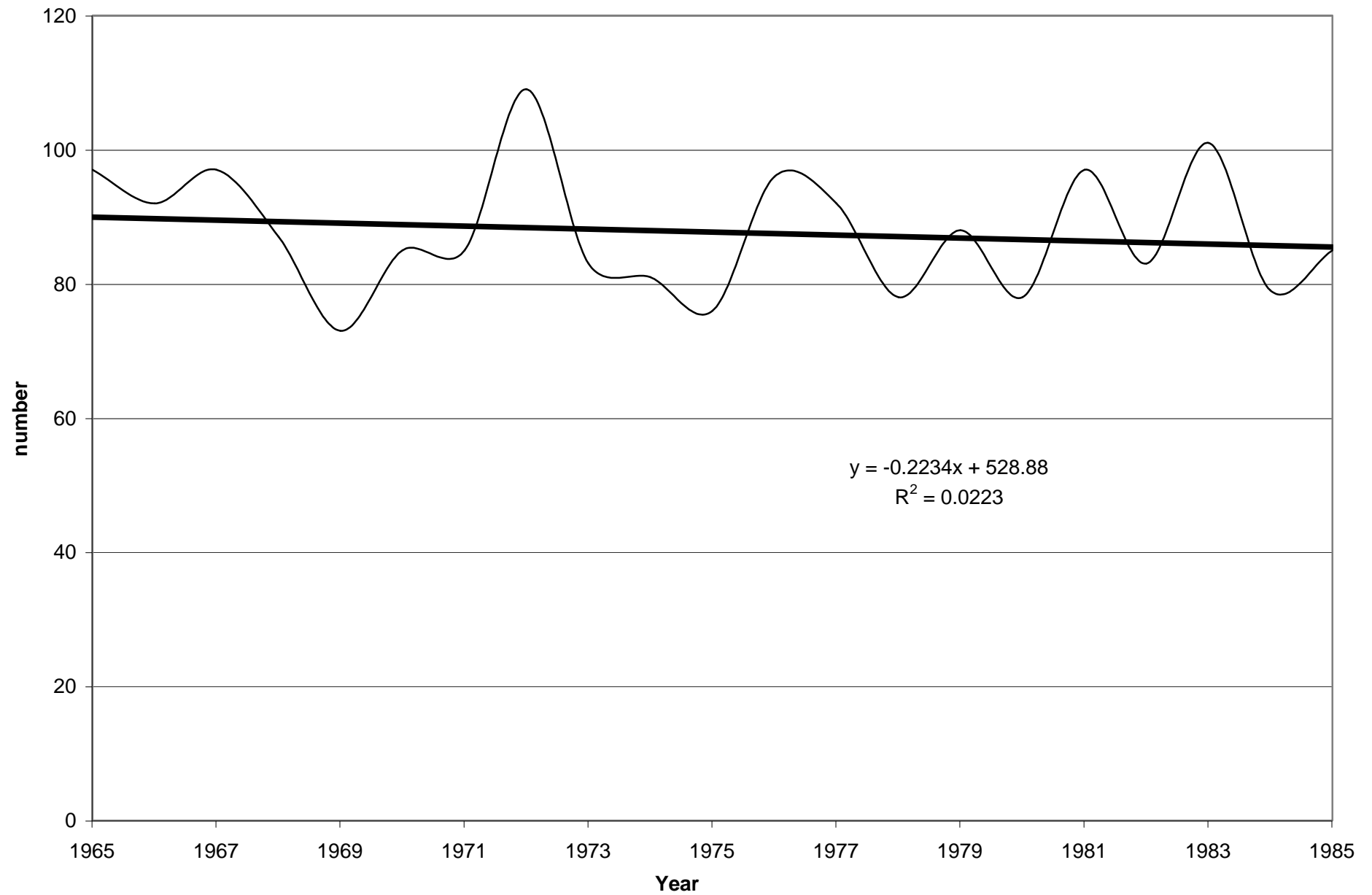
**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi**  
**Rise Rate**



Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi  
Fall Rate



**Lake Rohunta Outlet near Athol, MA, Drainage Area=20.3 sq mi  
Reversals**



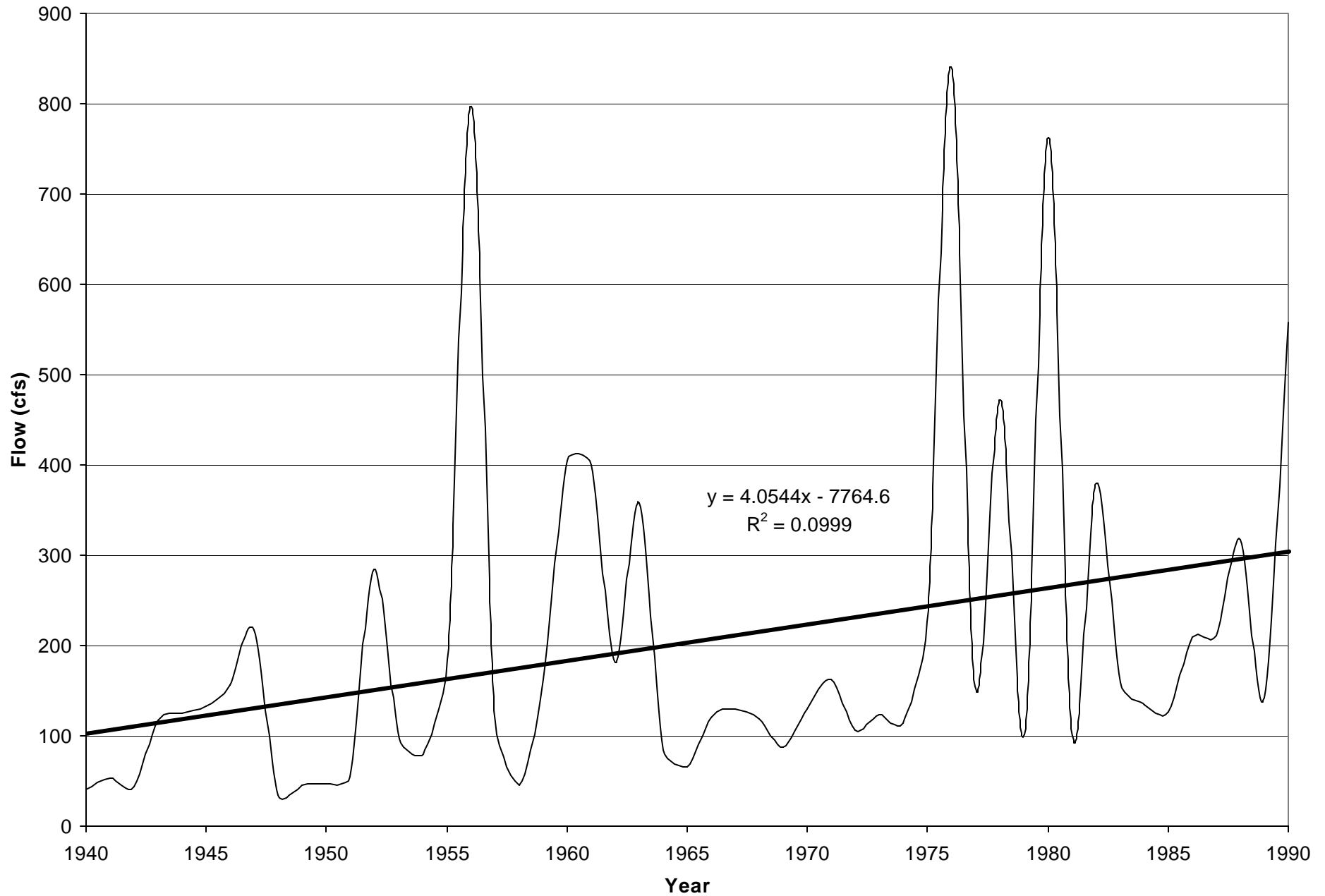


**Millers River at South Royalston, MA**  
**Drainage Area= 189.0 square miles**  
**Period of Record: Water Years 1940-1990**  
***IHA Results***

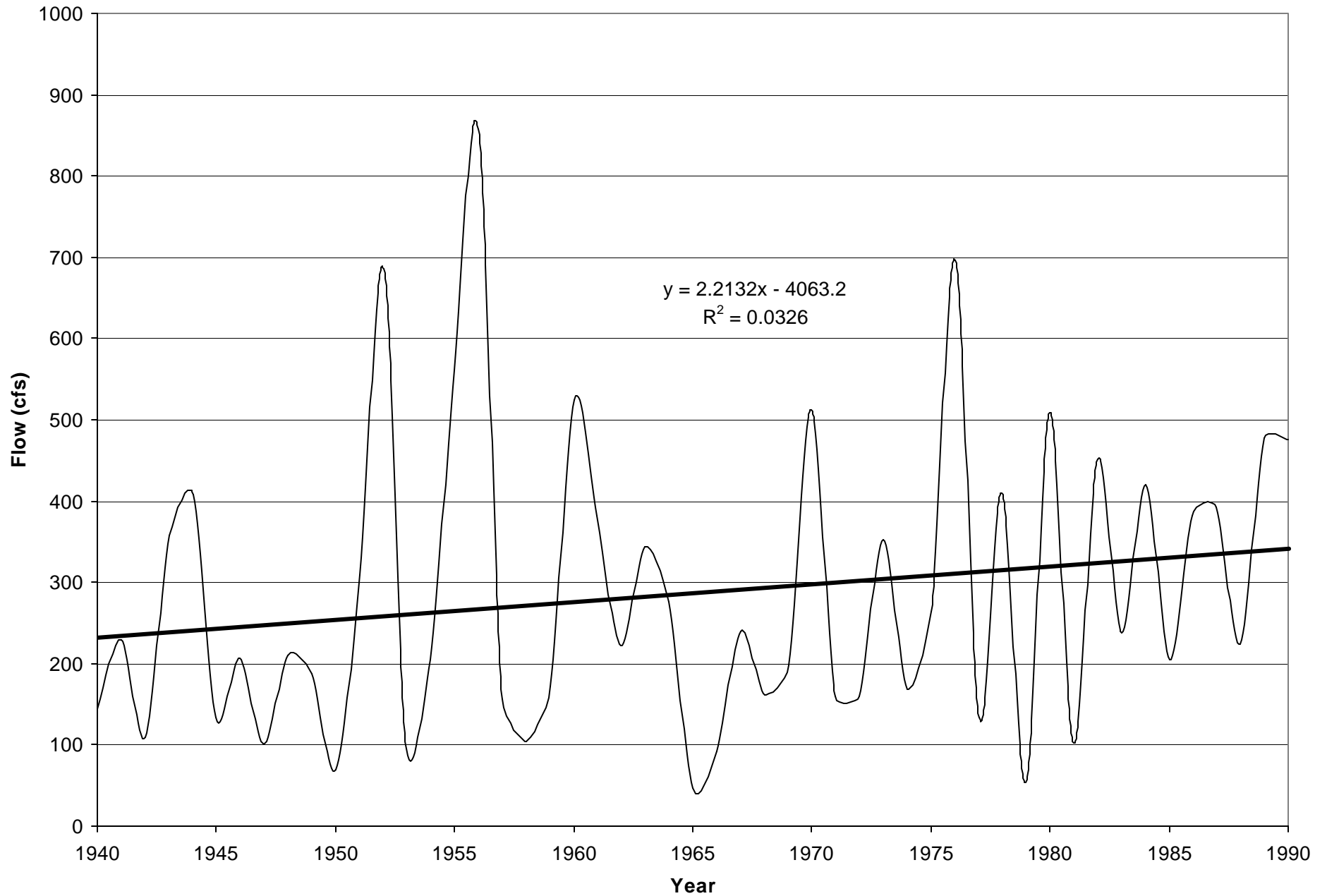
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1. Average Monthly Flow for October
2. Average Monthly Flow for November
3. Average Monthly Flow for December
4. Average Monthly Flow for January
5. Average Monthly Flow for February
6. Average Monthly Flow for March
7. Average Monthly Flow for April
8. Average Monthly Flow for May
9. Average Monthly Flow for June
10. Average Monthly Flow for July
11. Average Monthly Flow for August
12. Average Monthly Flow for September
13. 1-Day Minimum Flow
14. 3-Day Minimum Flow
15. 7-Day Minimum Flow
16. 30-Day Minimum Flow
17. 90-Day Minimum Flow
18. 1-Day Maximum Flow
19. 3-Day Maximum Flow
20. 7-Day Maximum Flow
21. 30-Day Maximum Flow
22. 90-Day Maximum Flow
23. Zero Days
24. Base Flow
25. Julian Date of Annual 1-Day Minimum Flow
26. Julian Date of Annual 1-Day Maximum Flow
27. Low Pulse Count
28. Low Pulse Duration
29. High Pulse Count
30. High Pulse Duration
31. Rise Rate
32. Fall Rate
33. Reversals

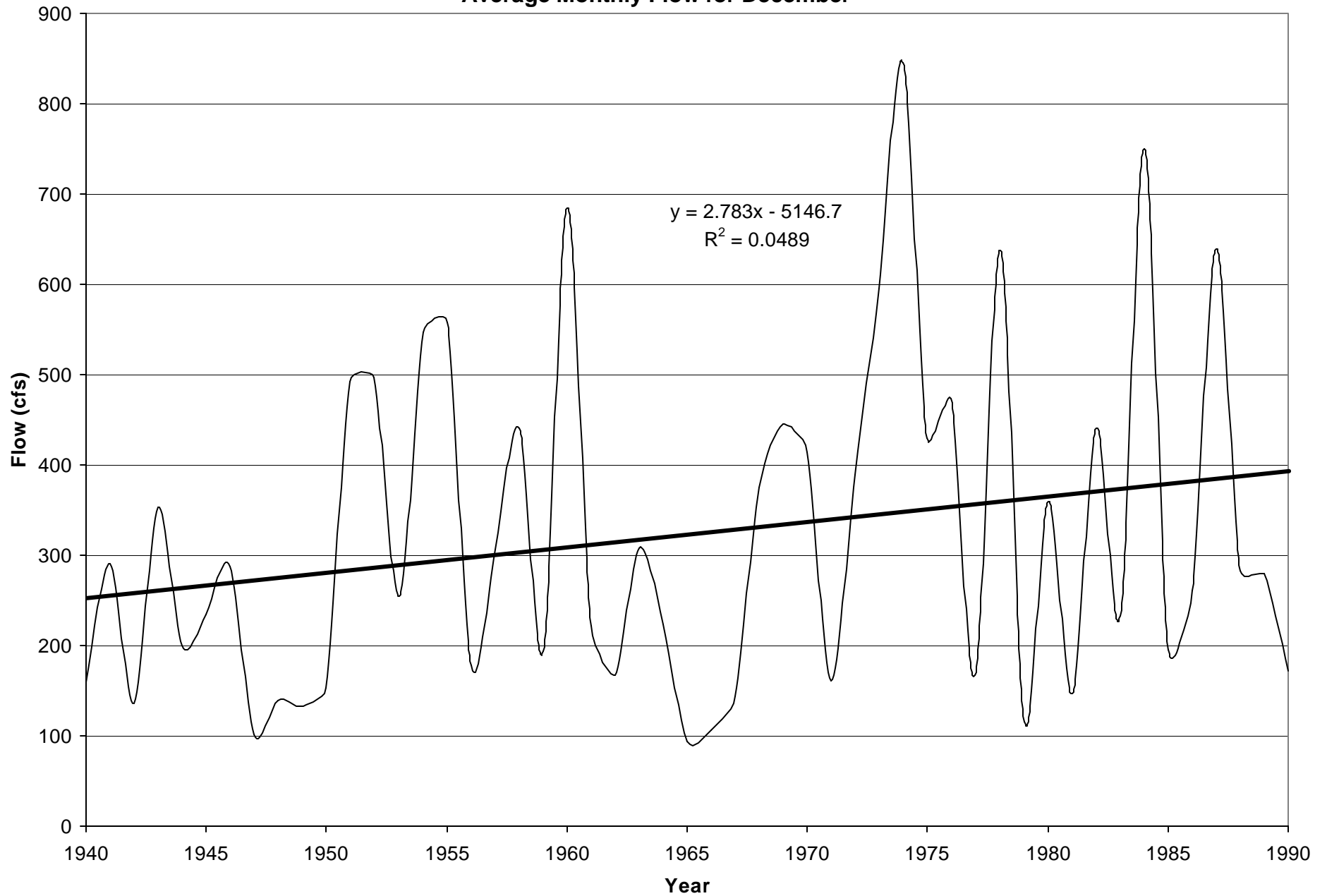
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for October**



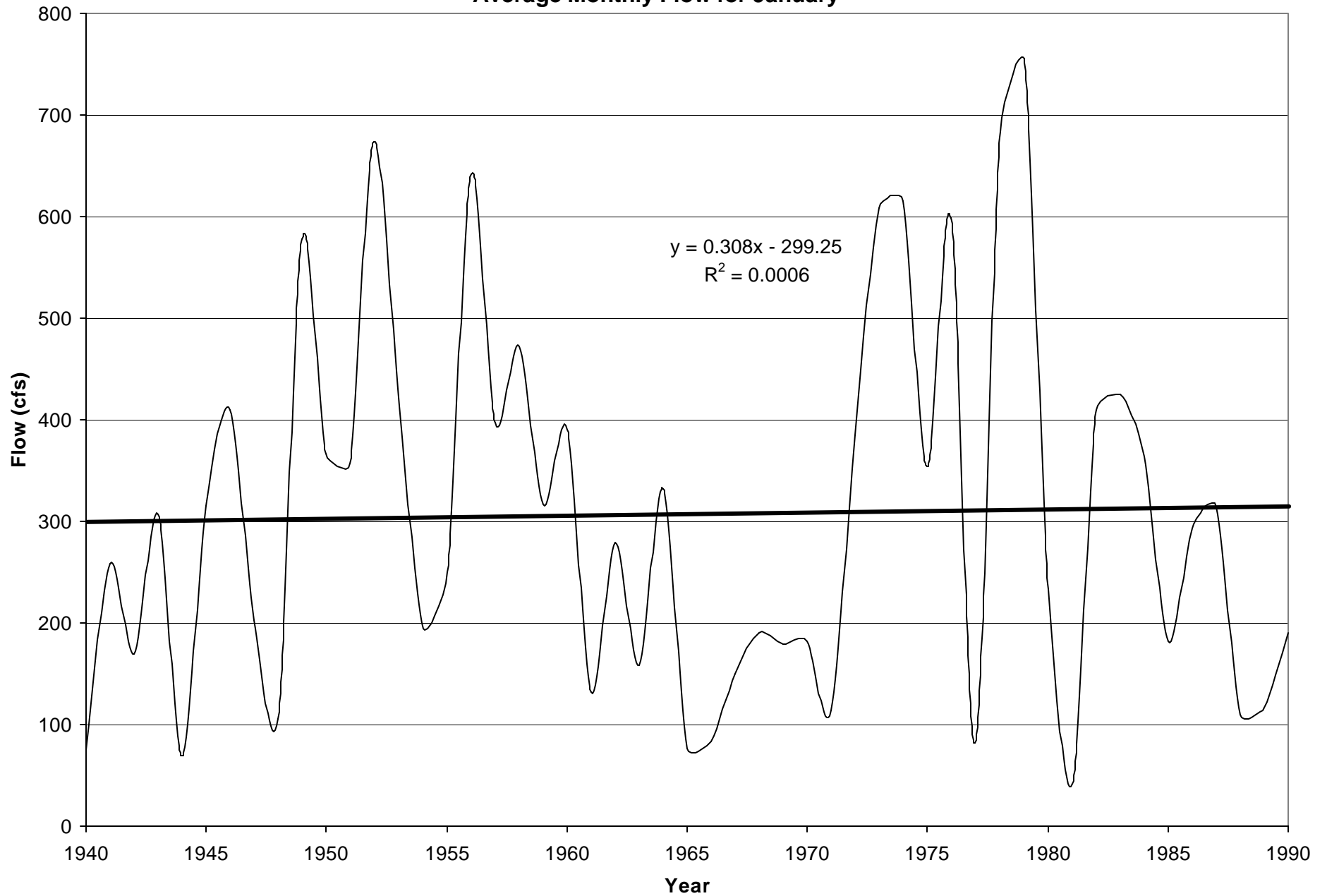
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for November**



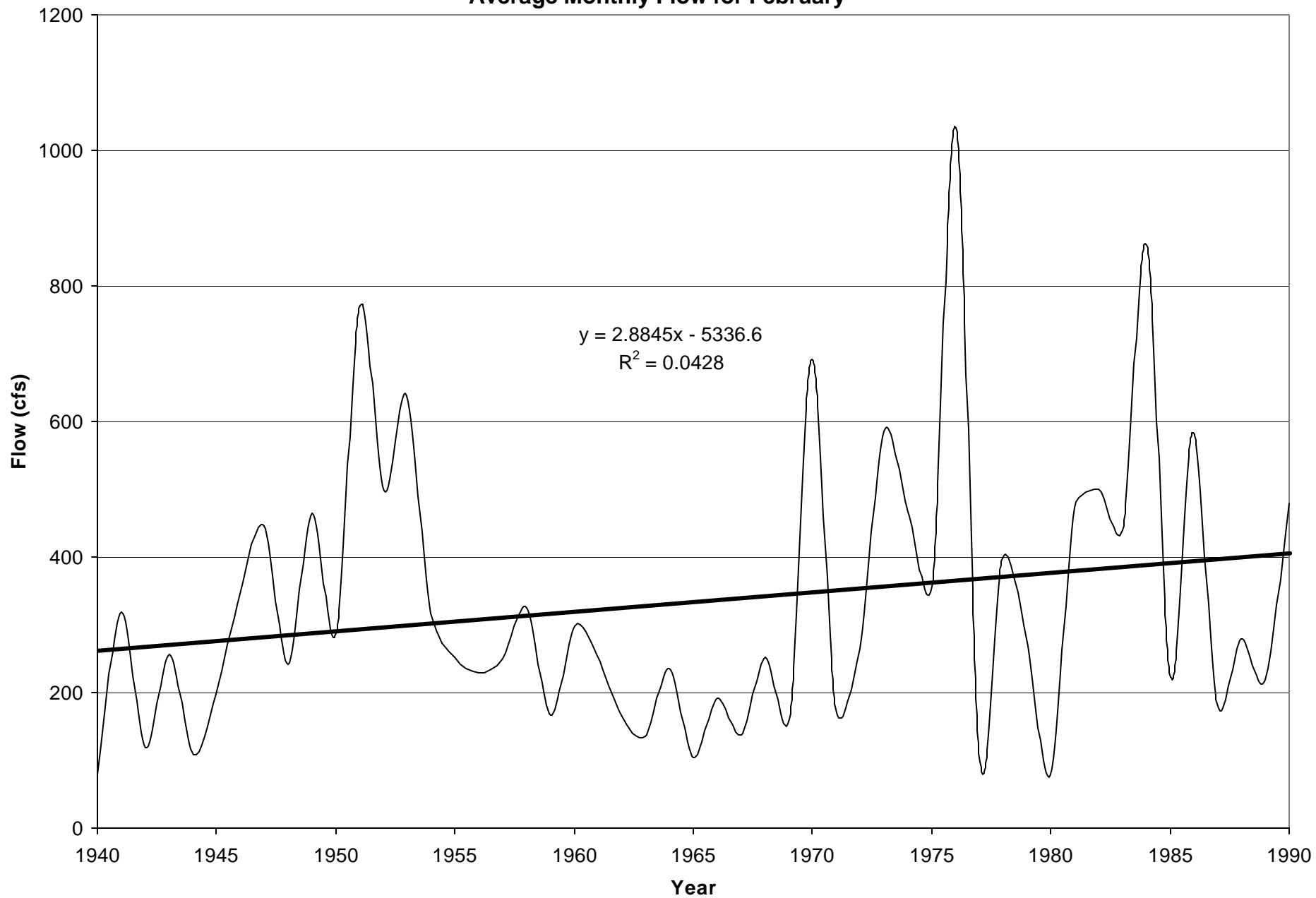
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for December**



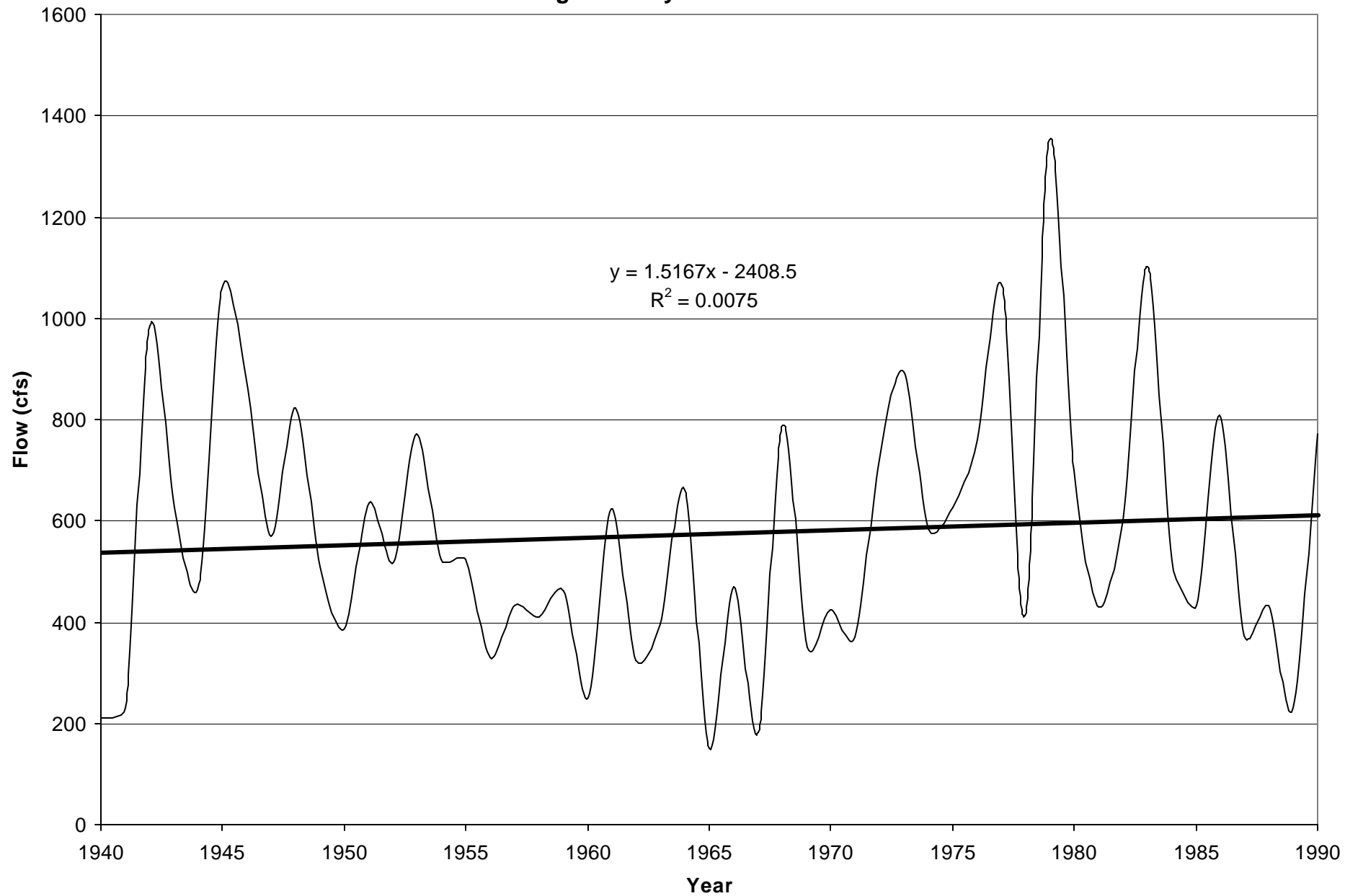
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for January**



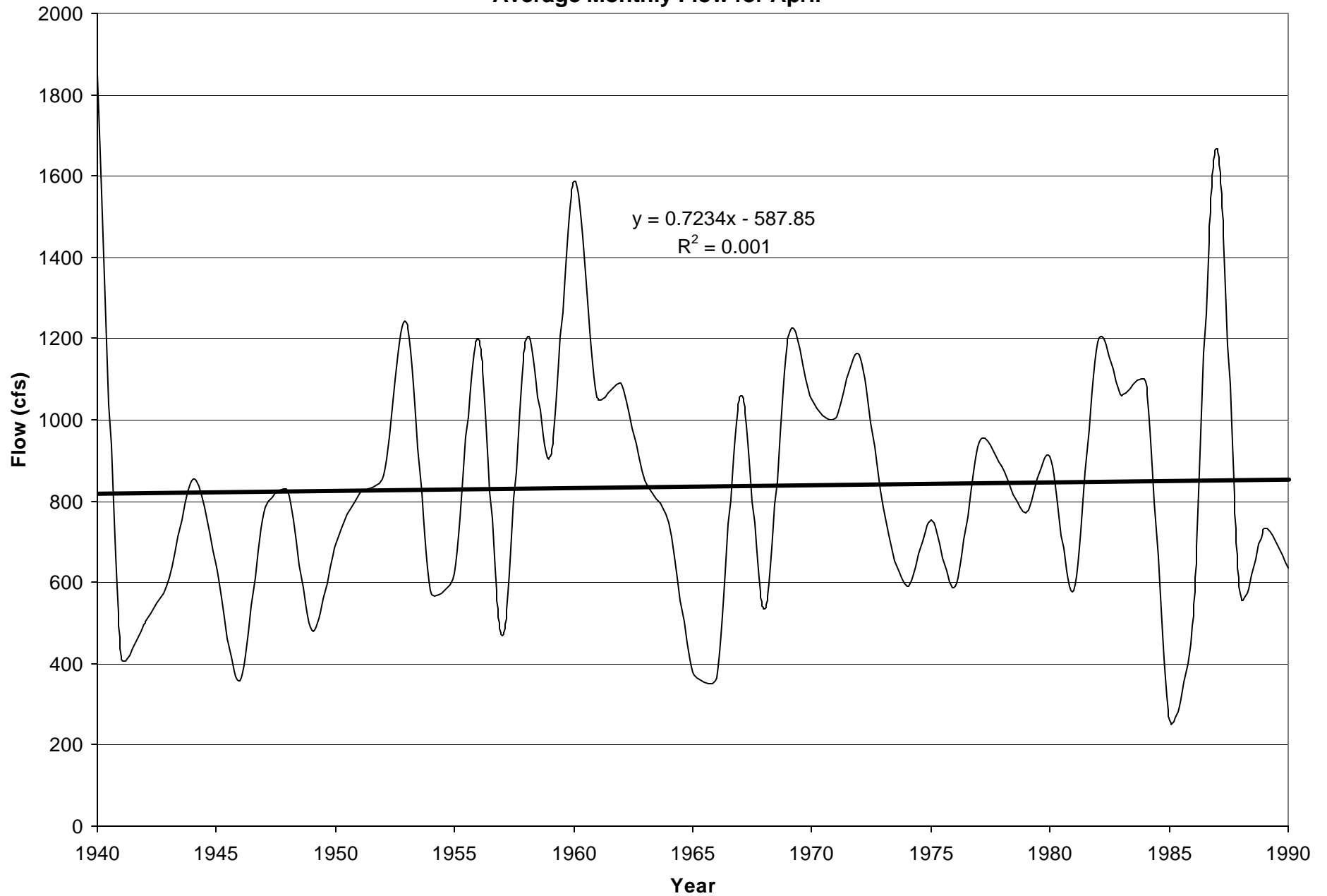
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for February**



**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for March**

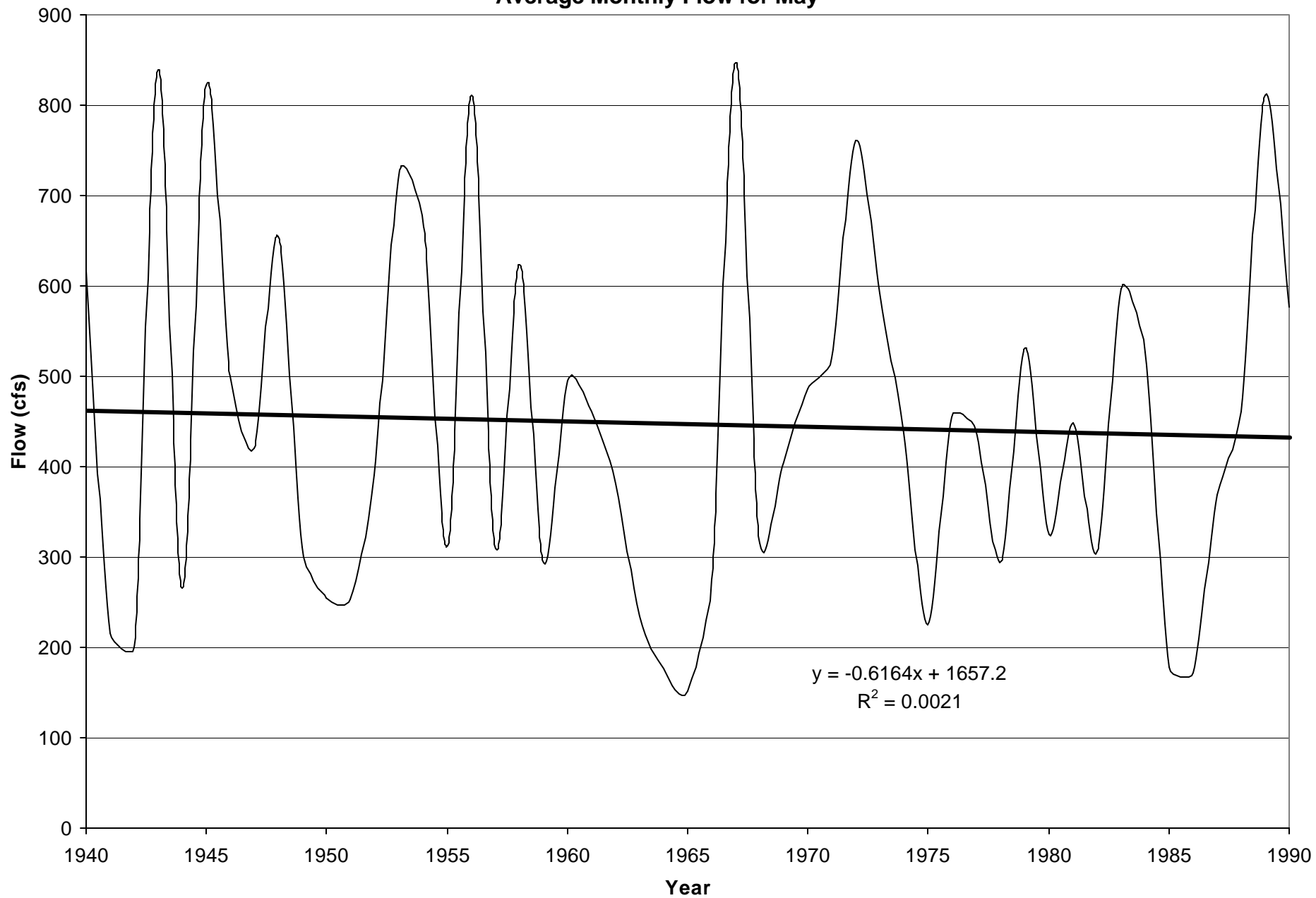


**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for April**

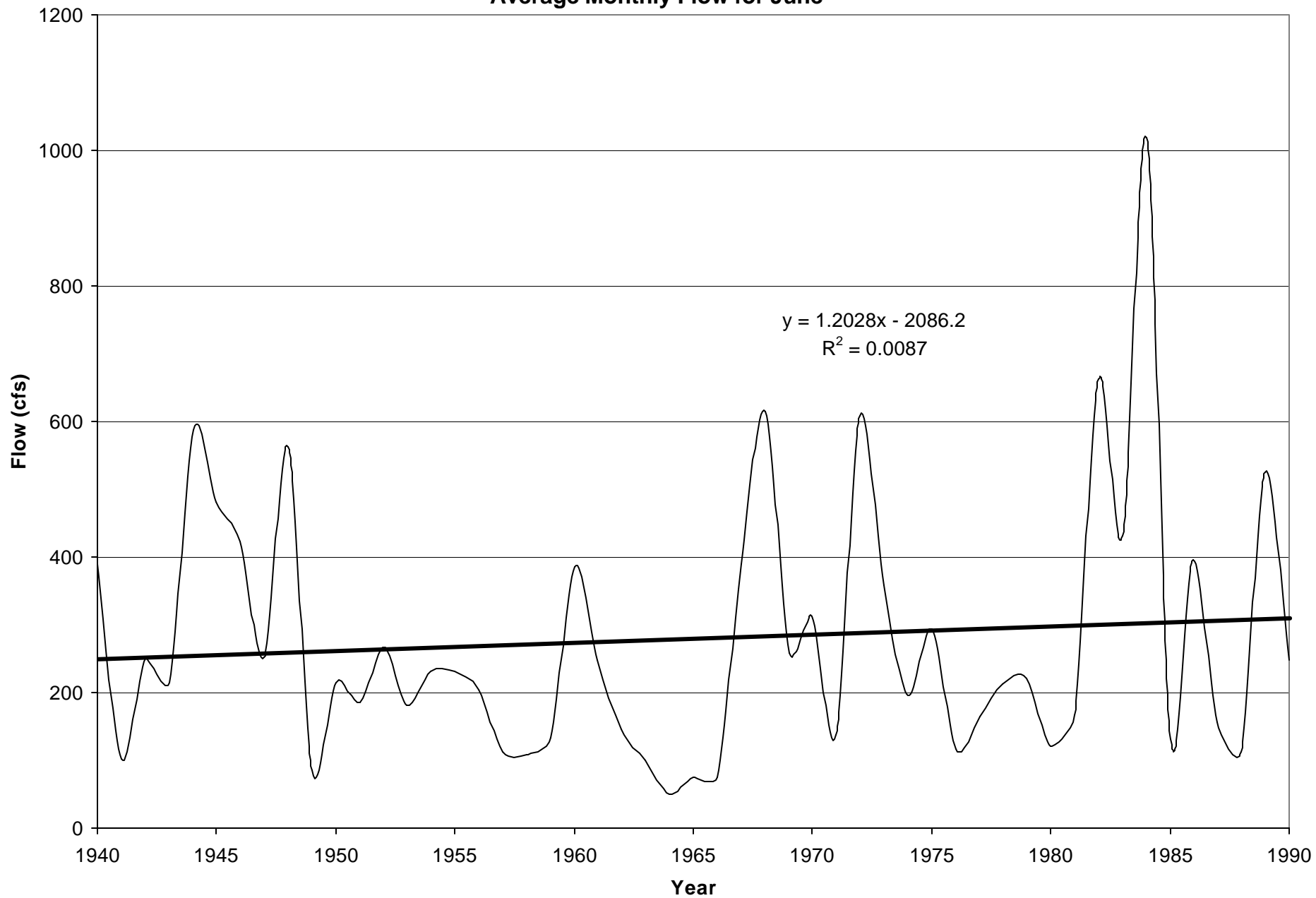




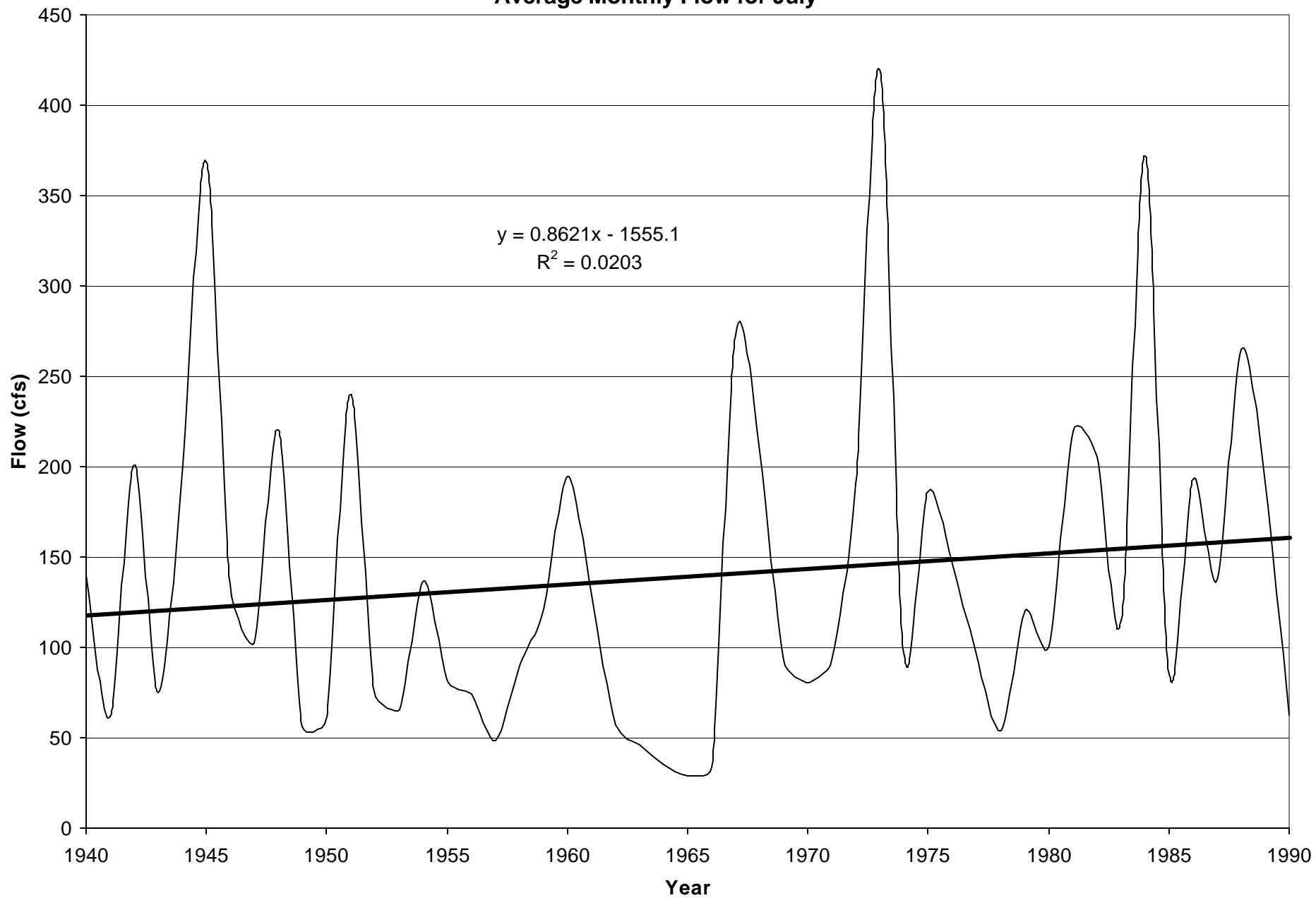
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for May**



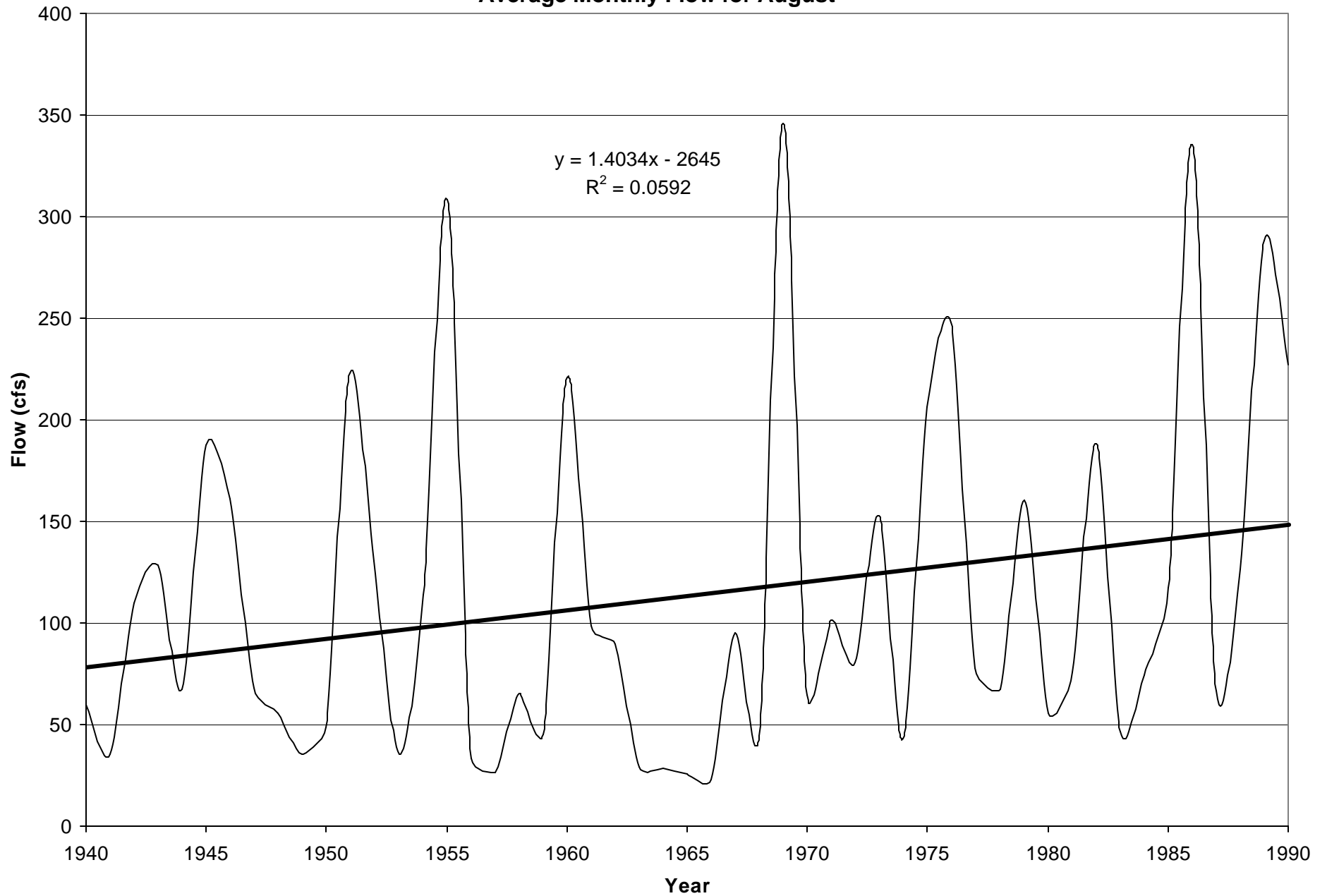
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for June**



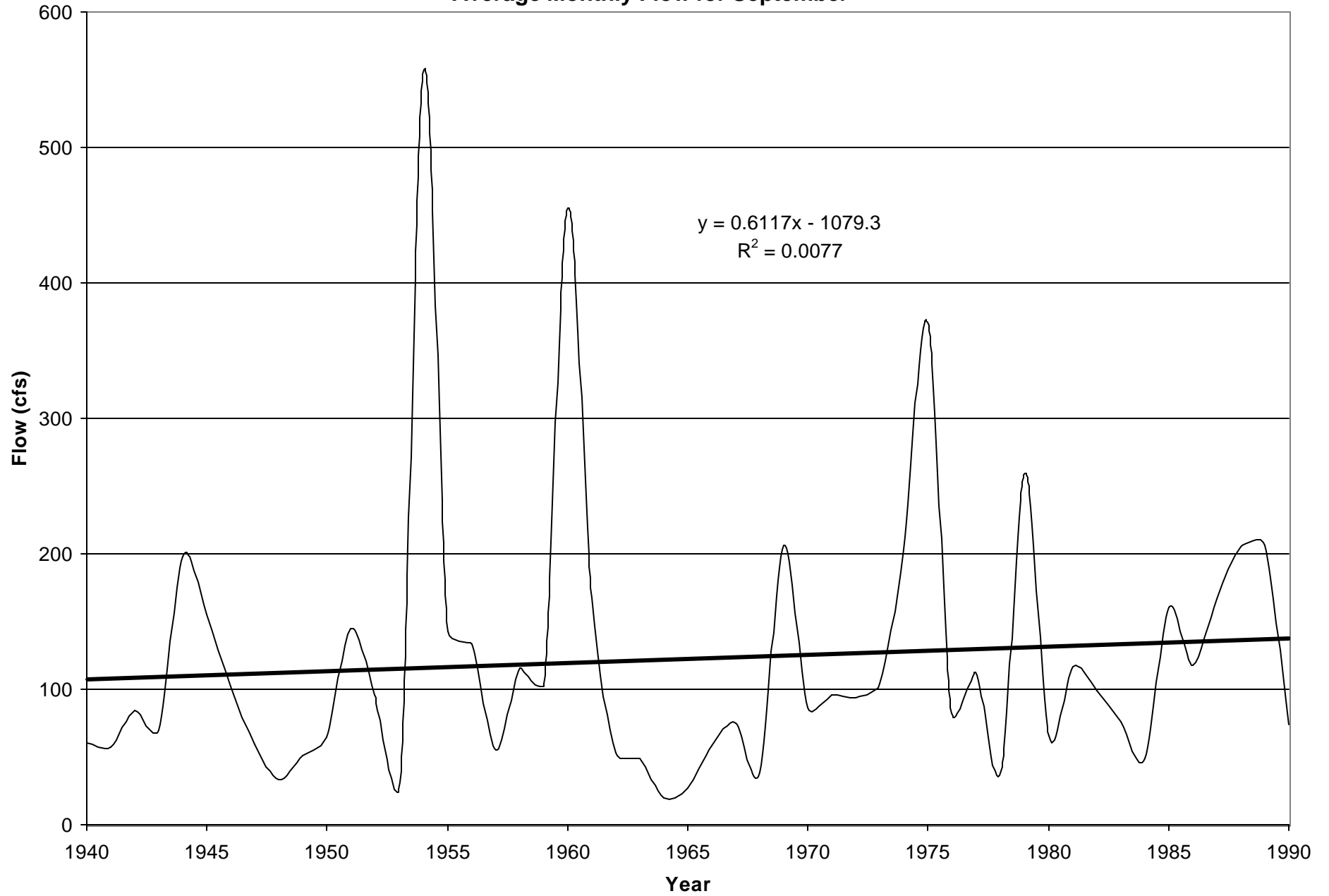
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for July**



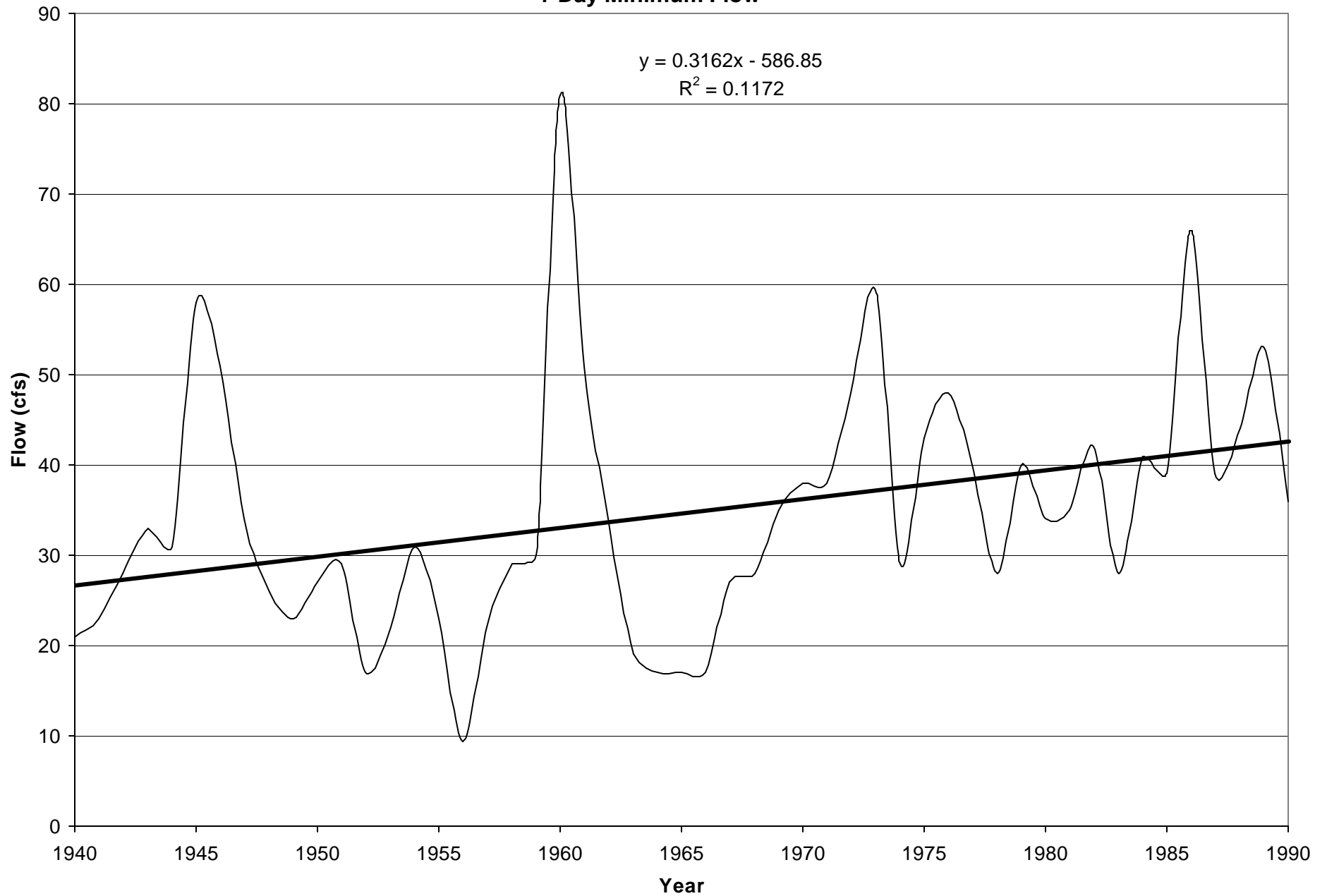
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for August**



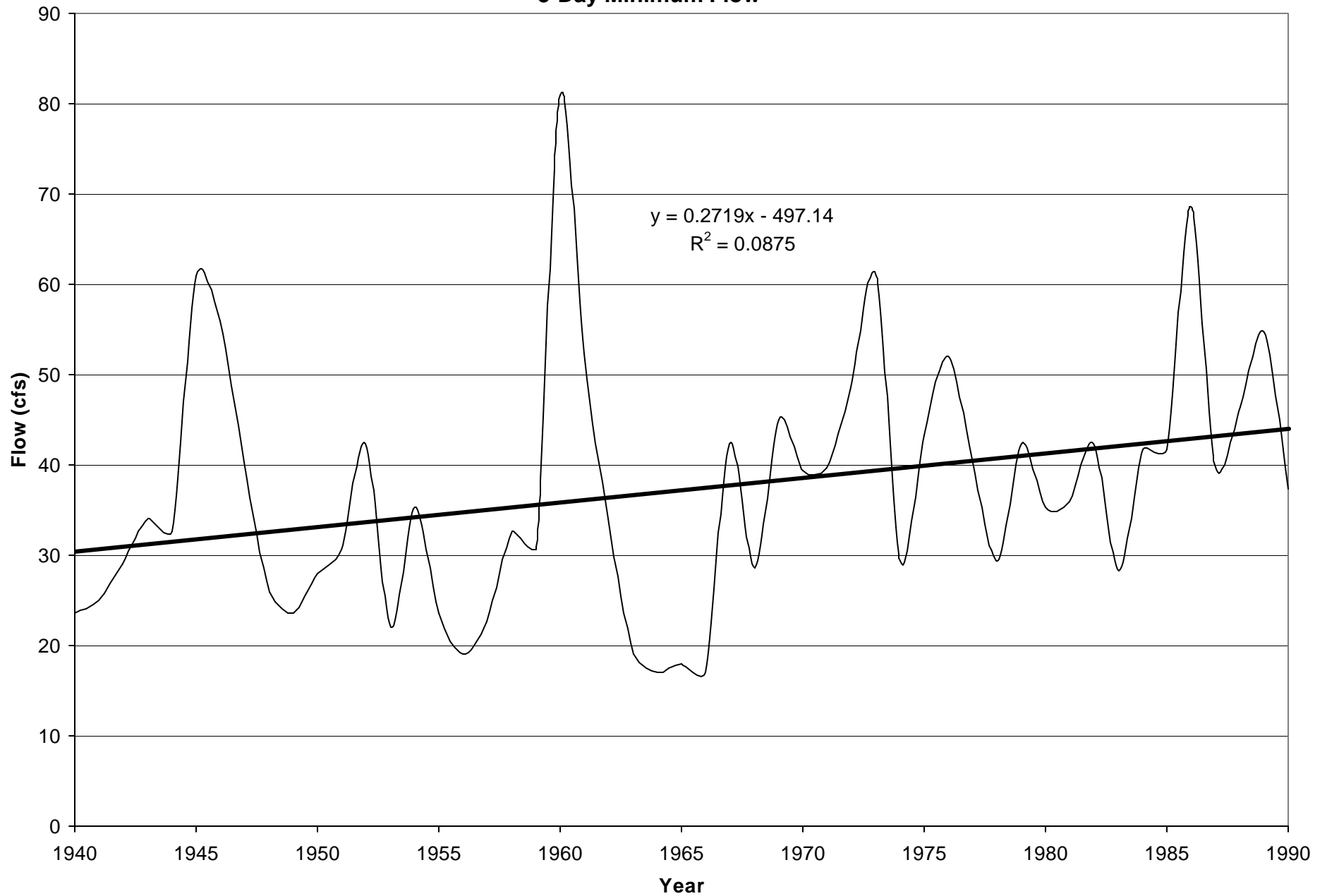
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Average Monthly Flow for September**



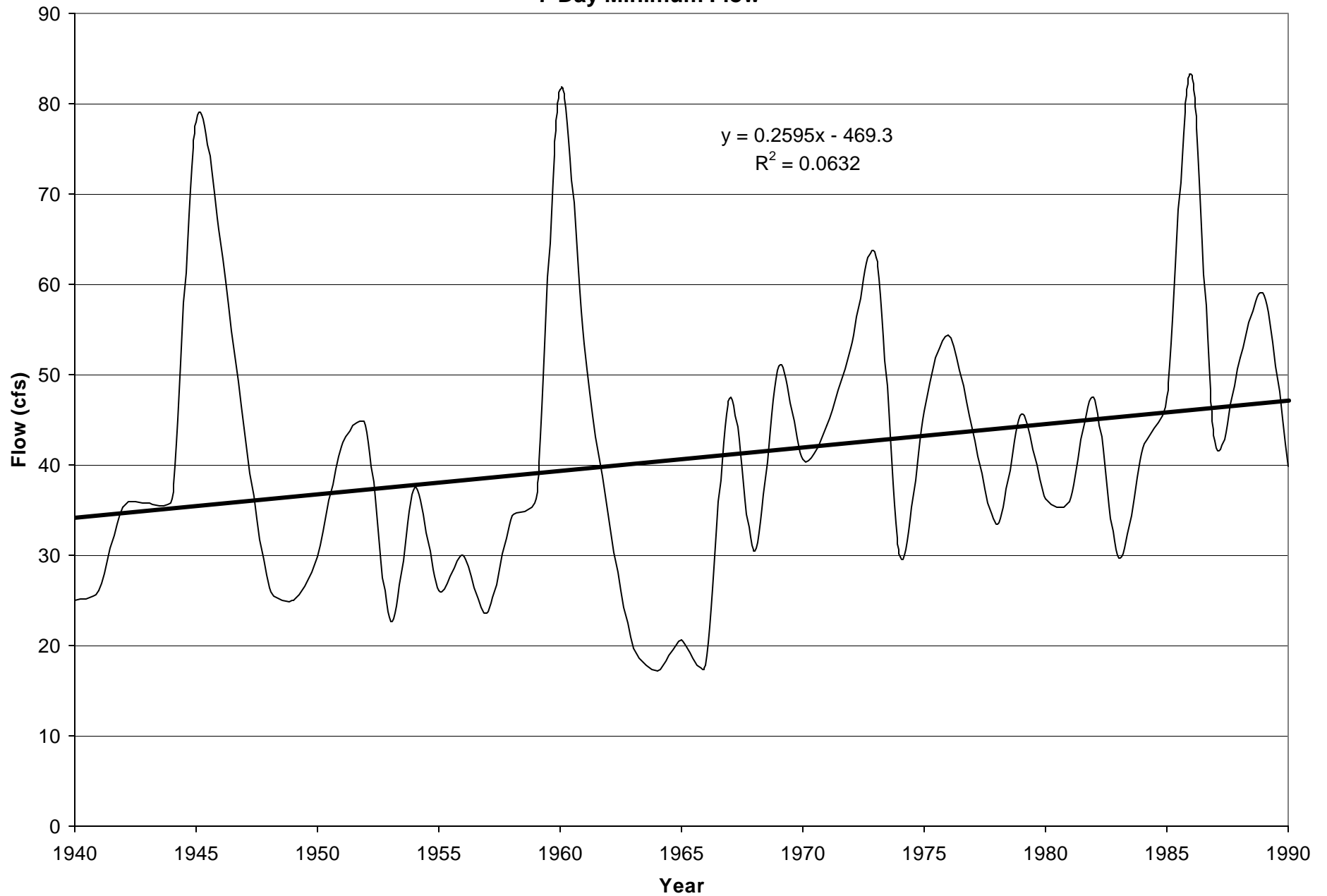
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**1-Day Minimum Flow**



**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**3-Day Minimum Flow**

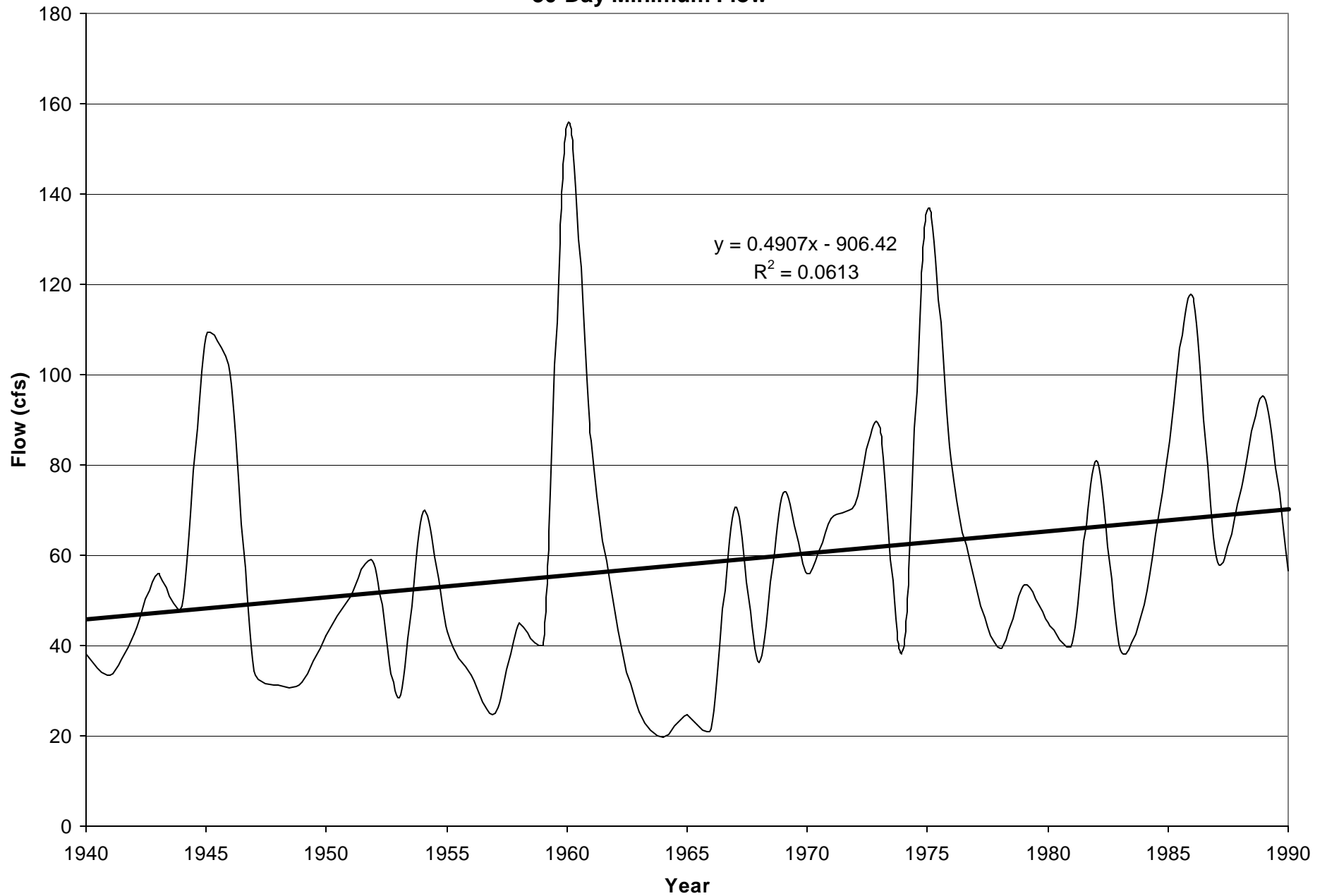


**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**7-Day Minimum Flow**

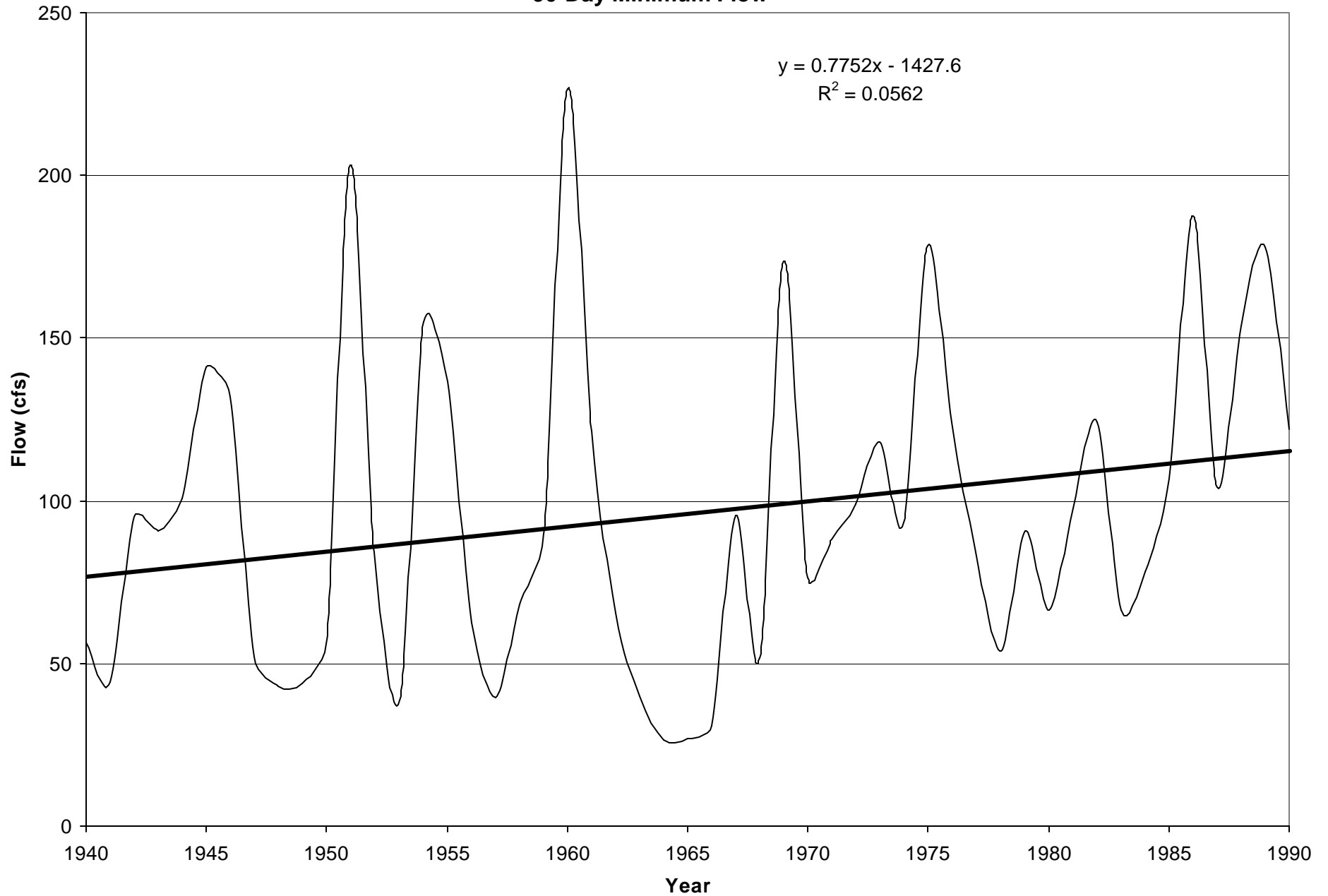




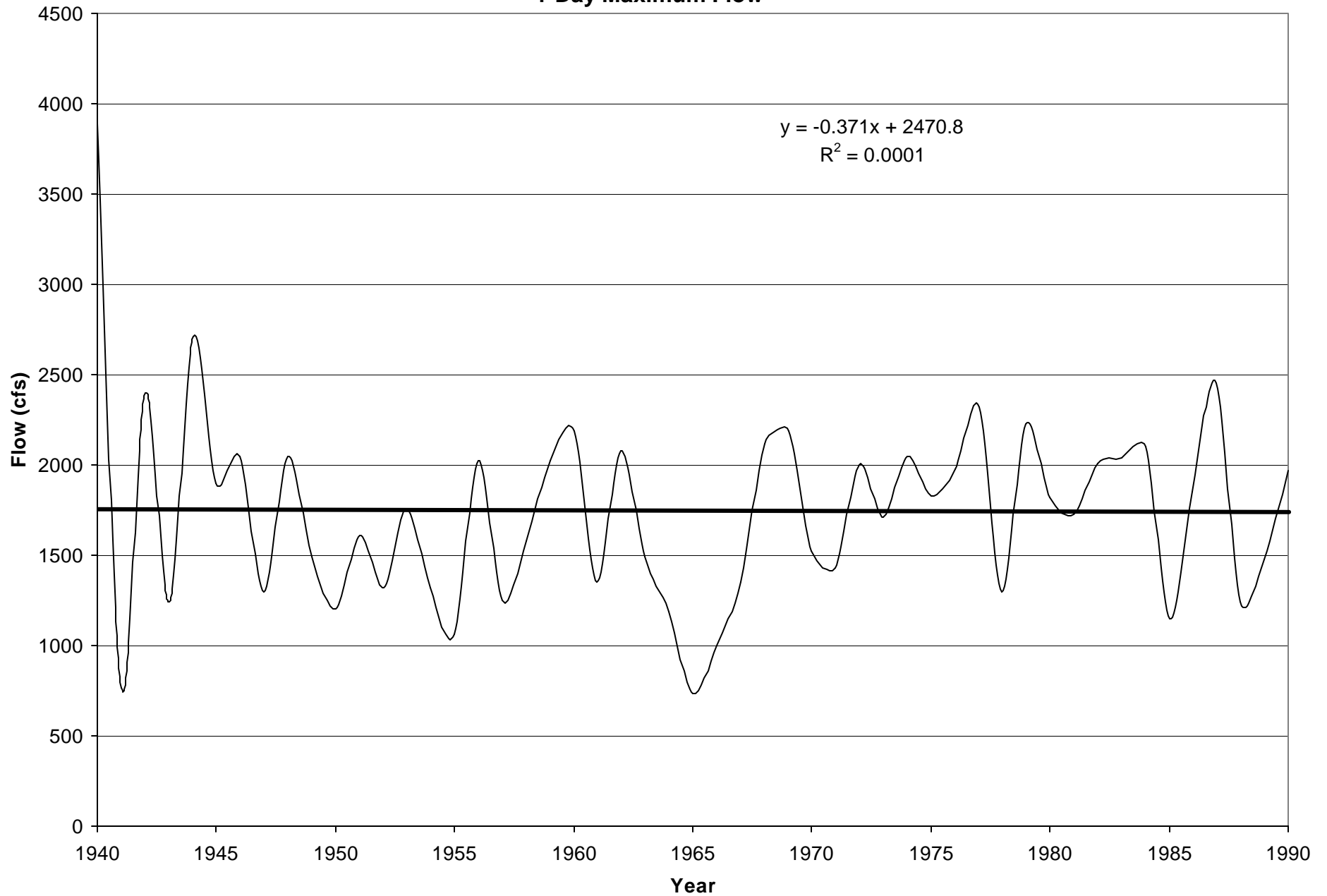
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**30-Day Minimum Flow**



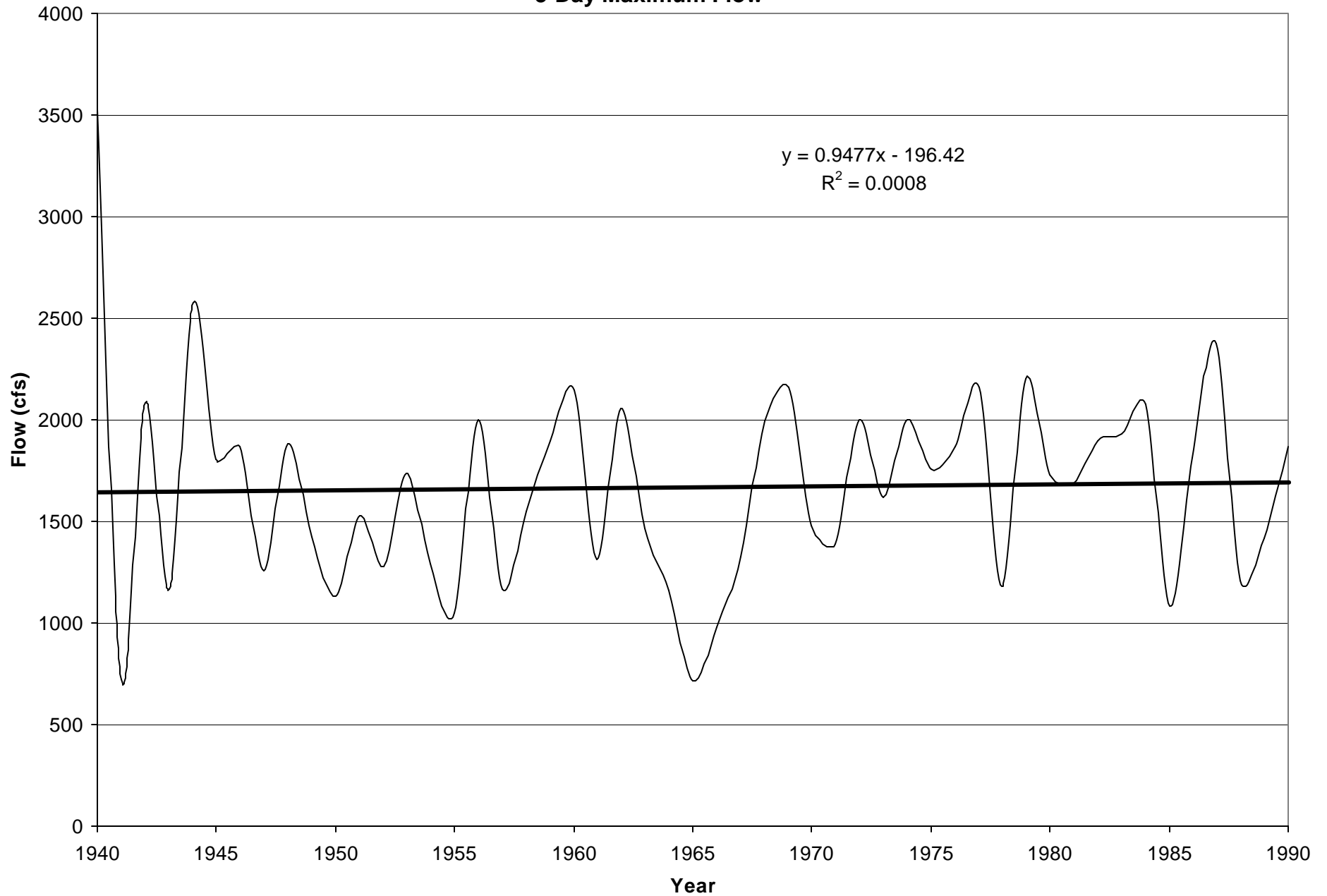
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**90-Day Minimum Flow**



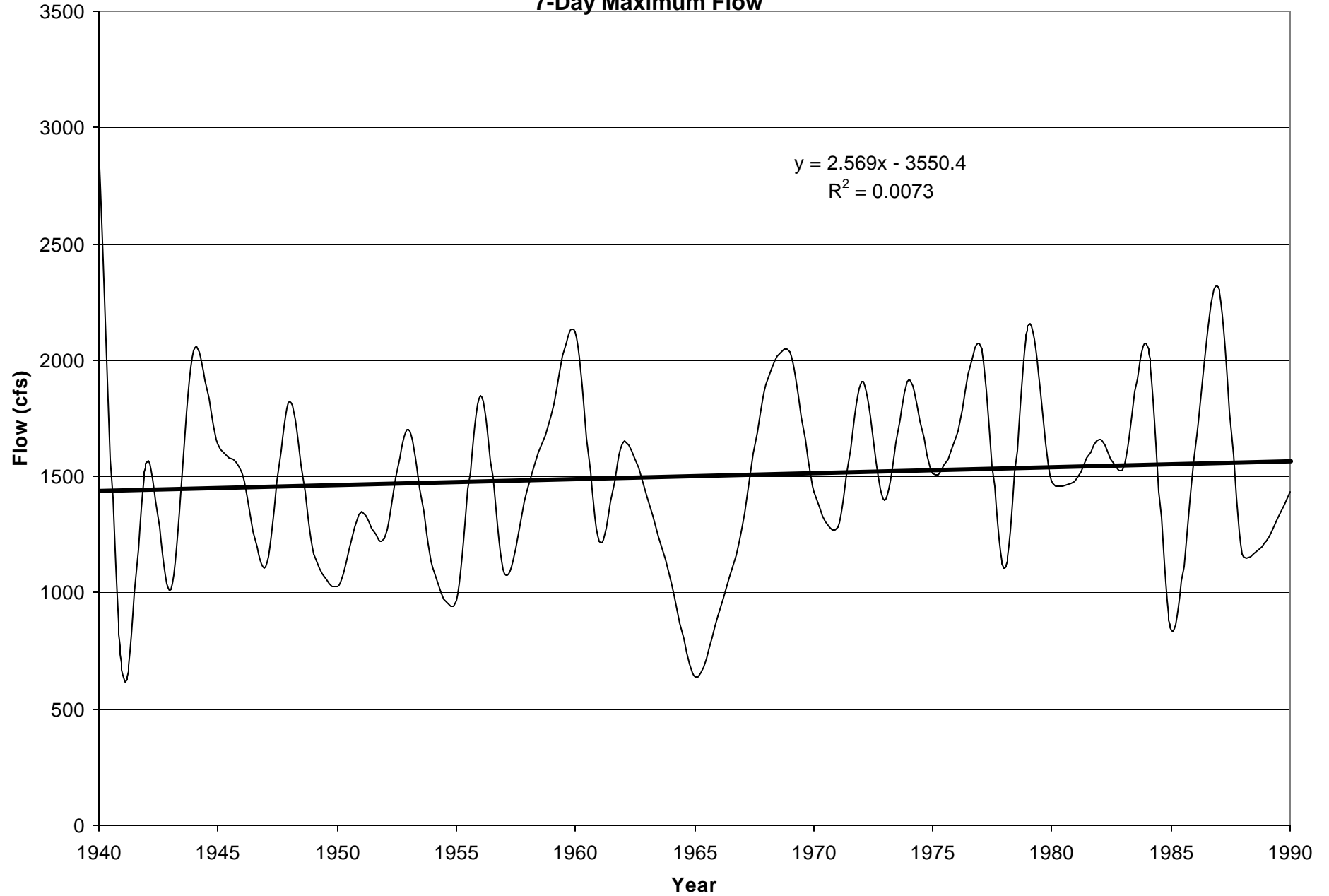
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**1-Day Maximum Flow**



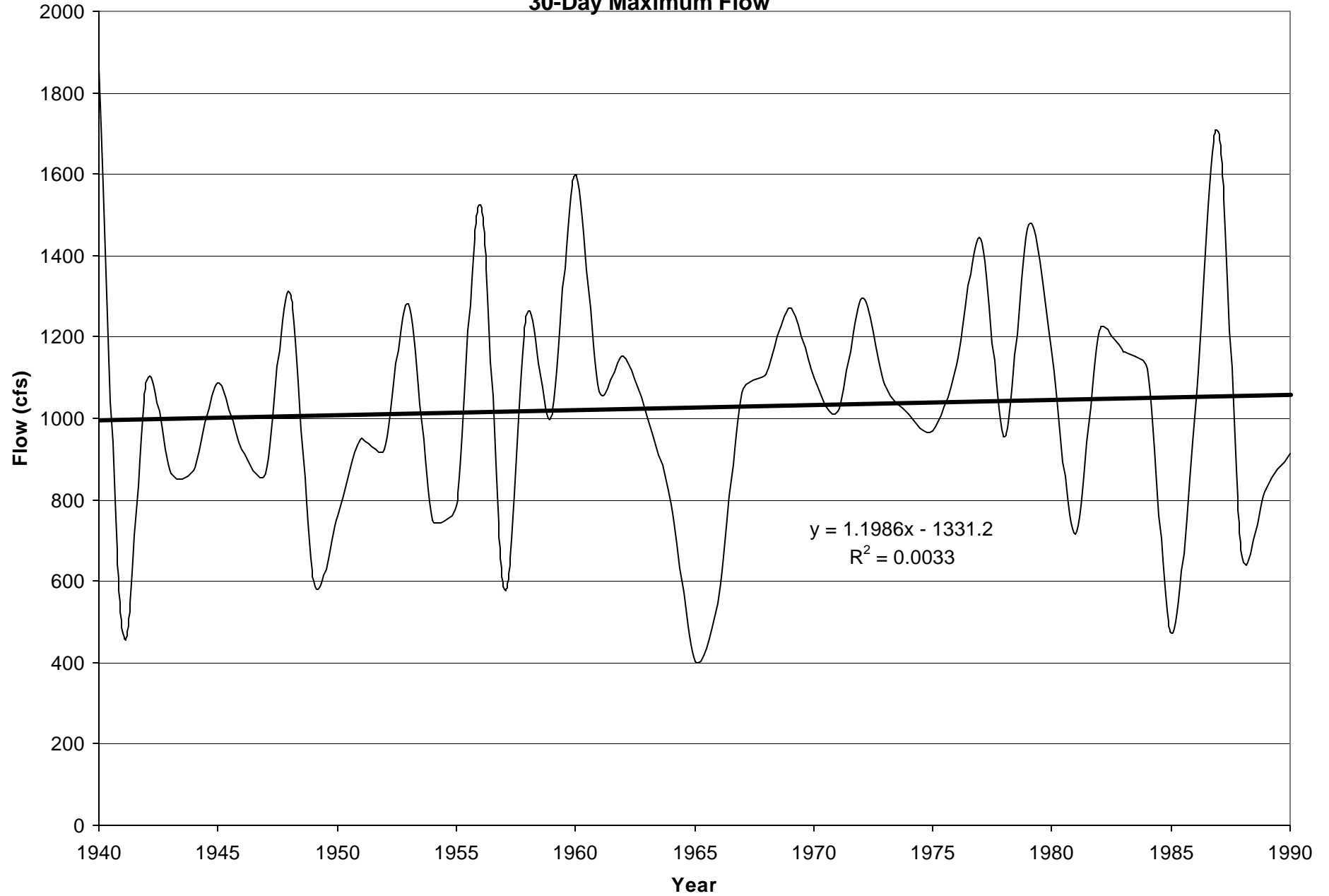
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**3-Day Maximum Flow**



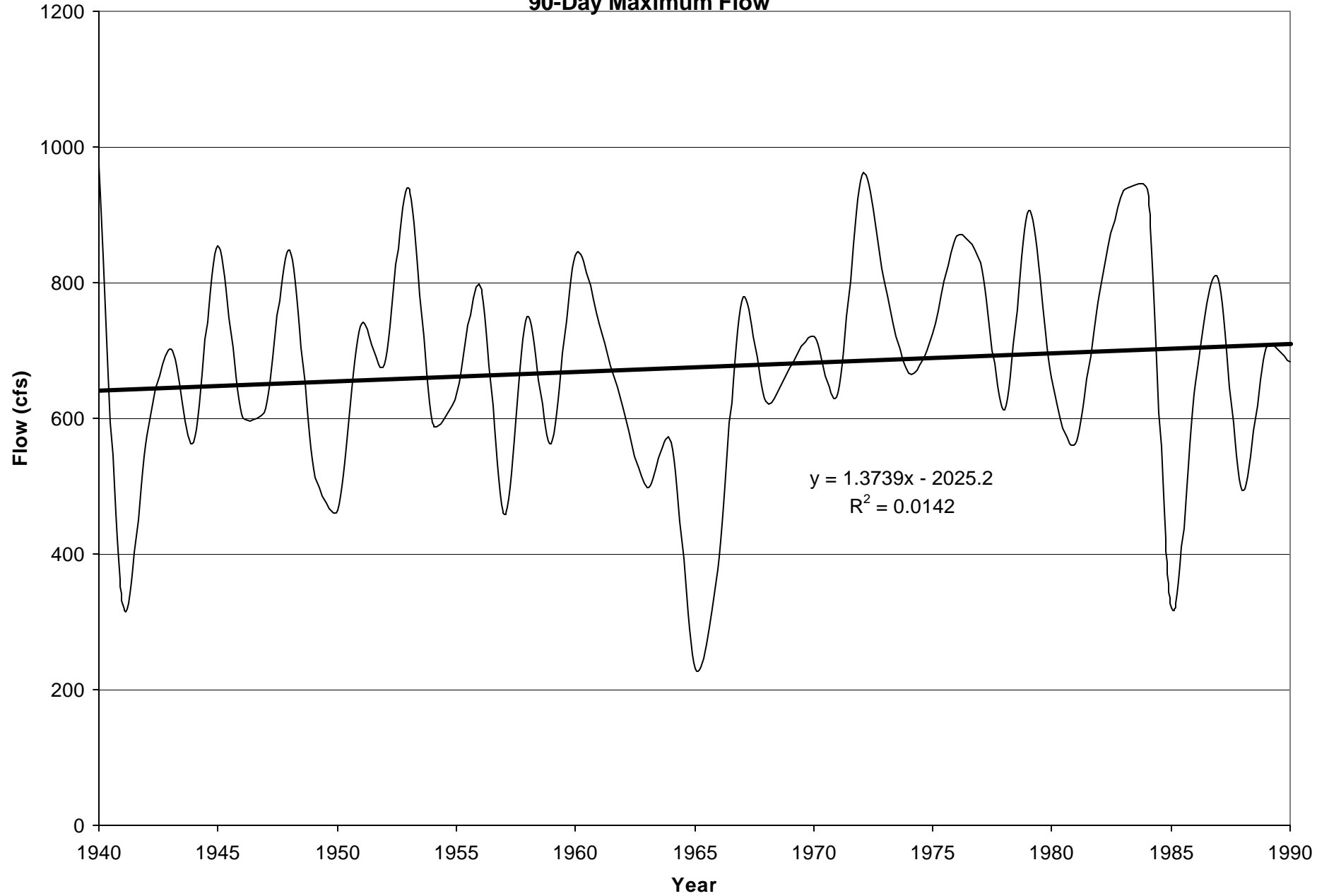
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**7-Day Maximum Flow**



**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**30-Day Maximum Flow**

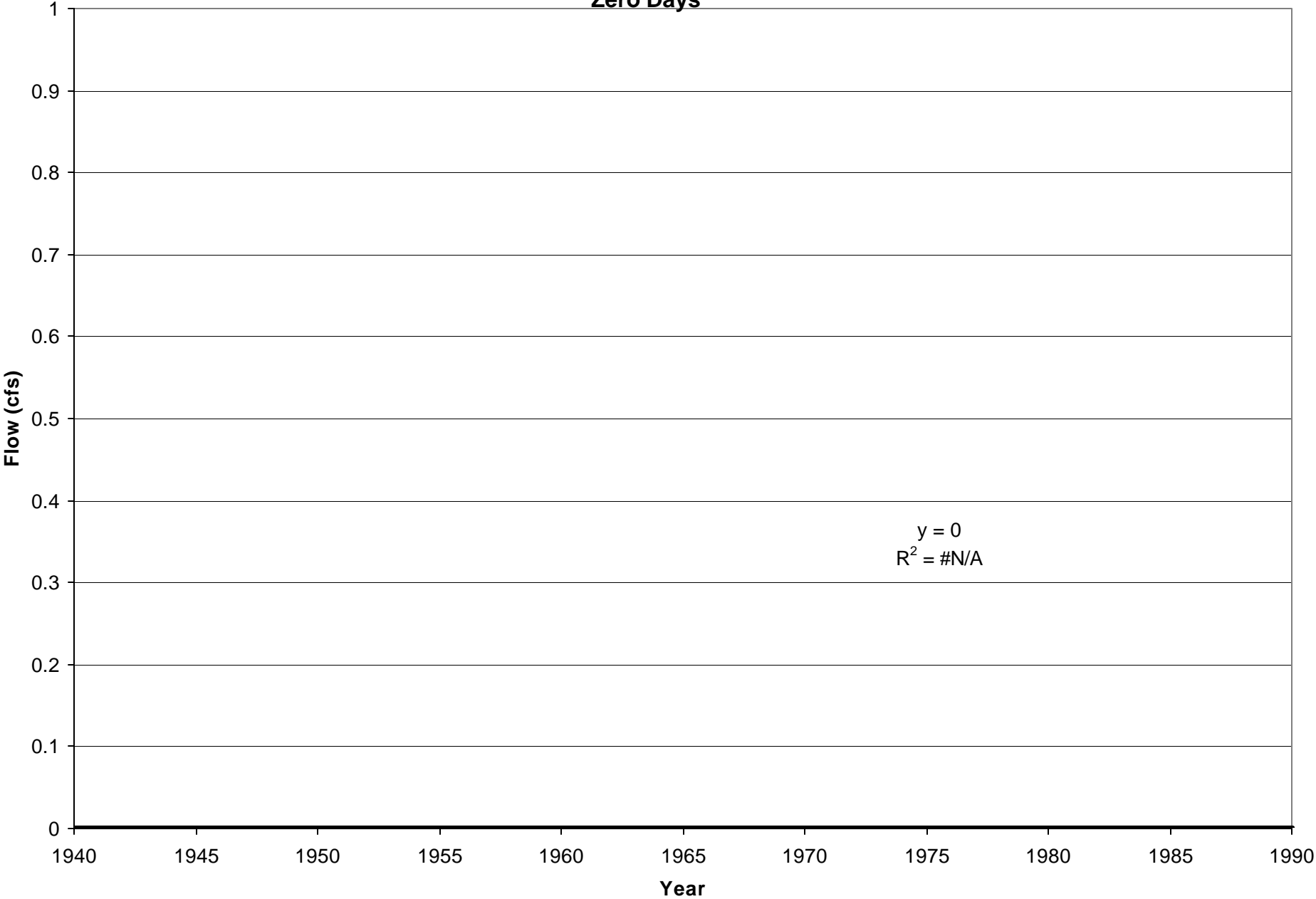


**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**90-Day Maximum Flow**



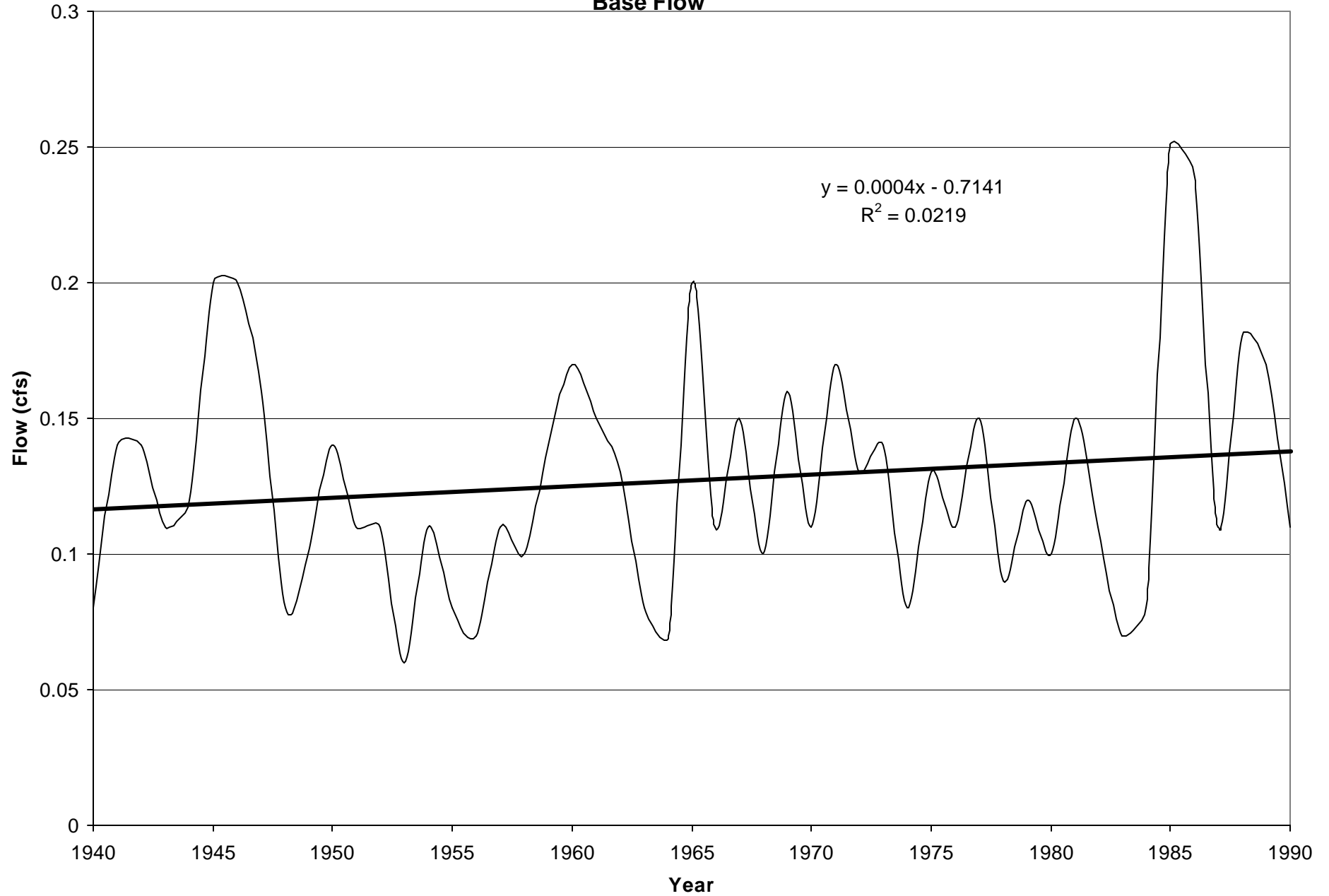
Millers River at South Royalston, Drainage Area= 189 sq mi

Zero Days

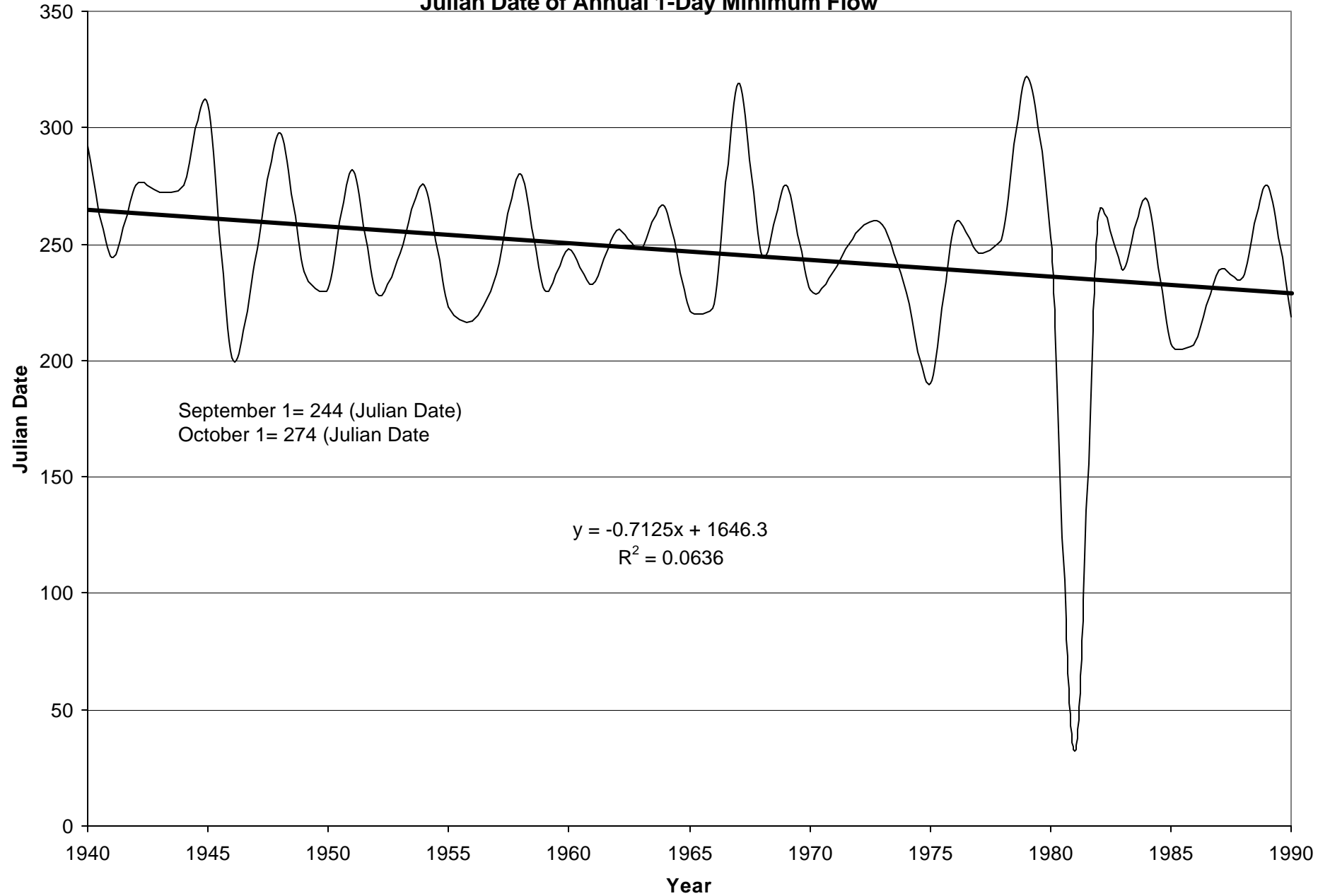




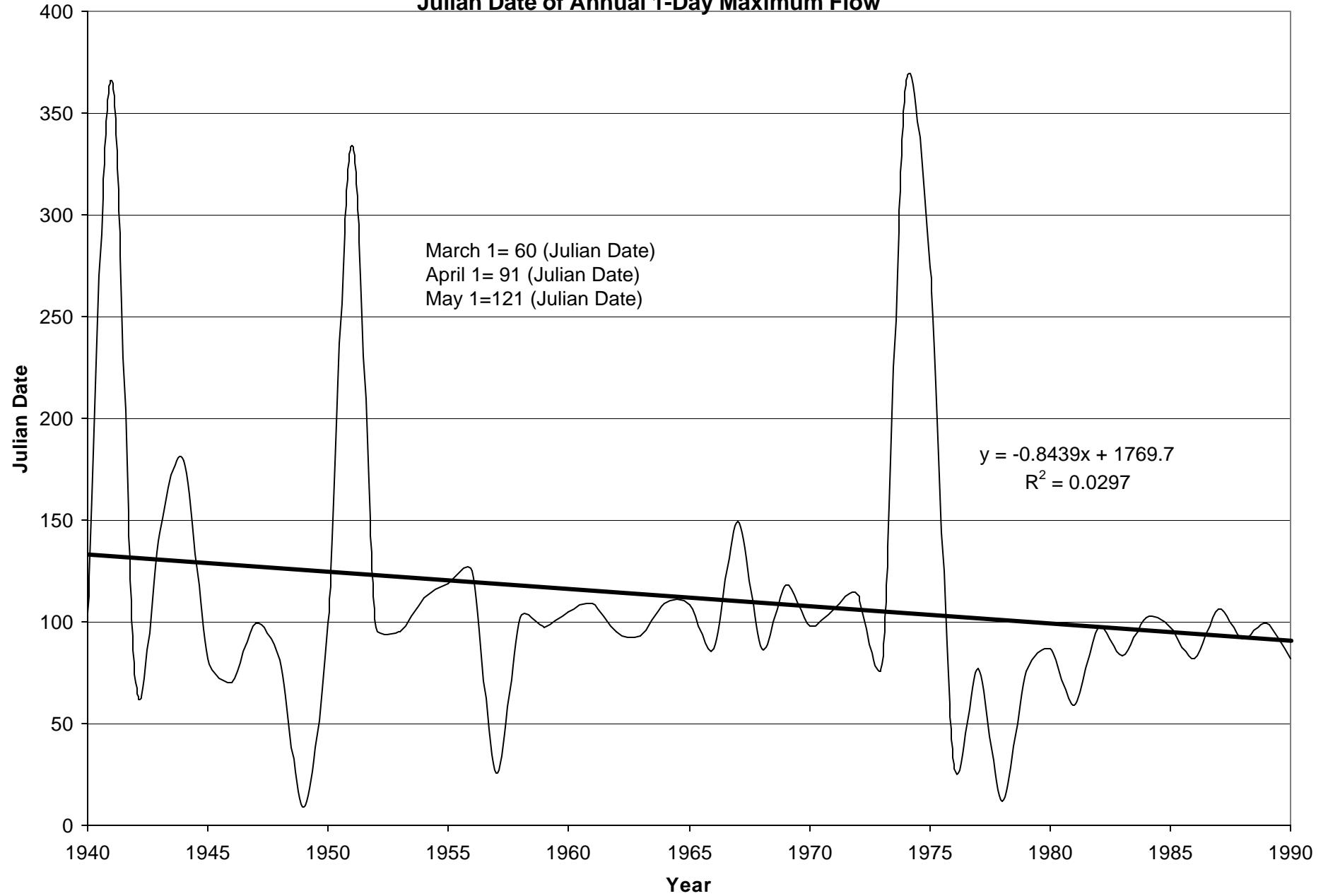
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Base Flow**



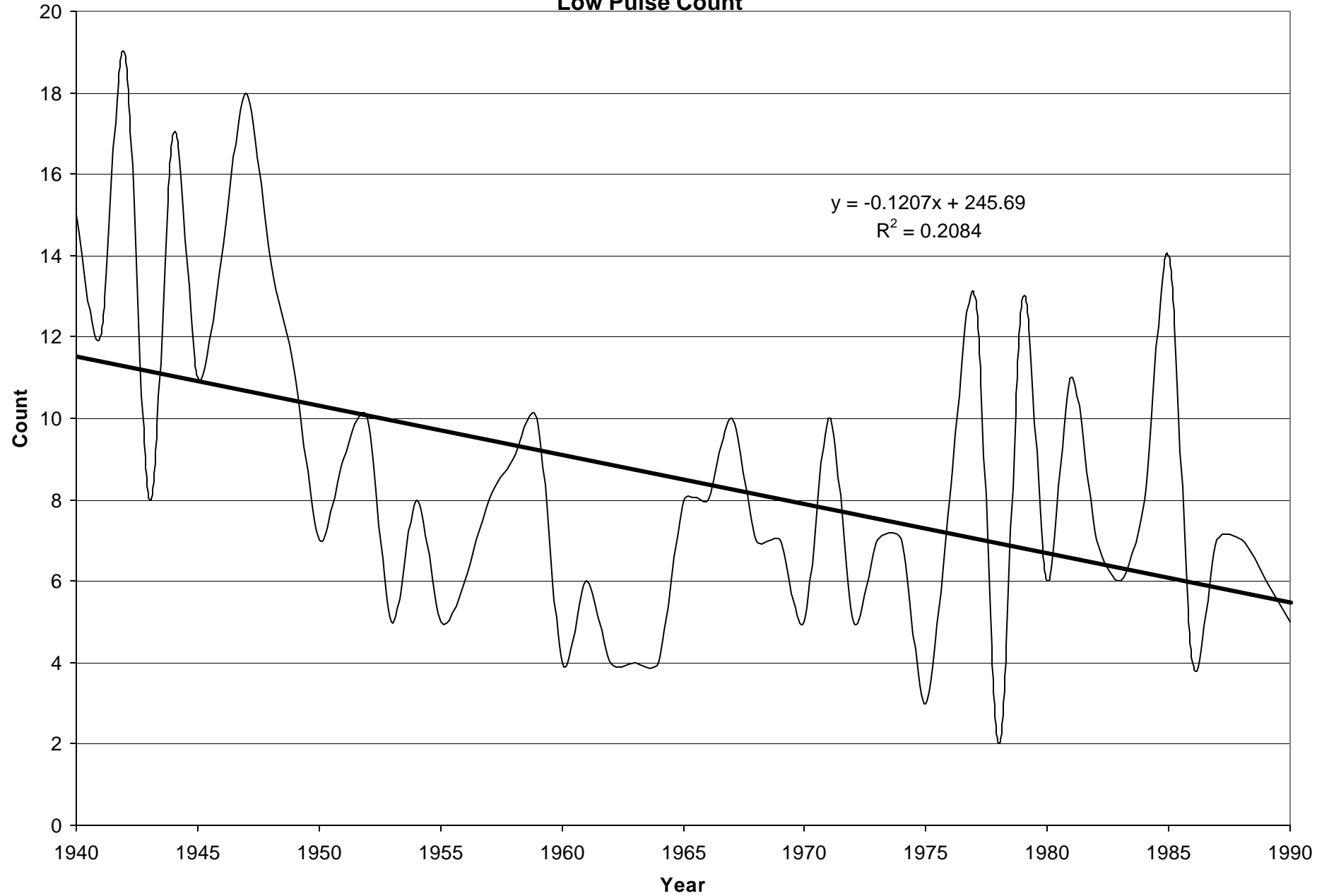
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Julian Date of Annual 1-Day Minimum Flow**



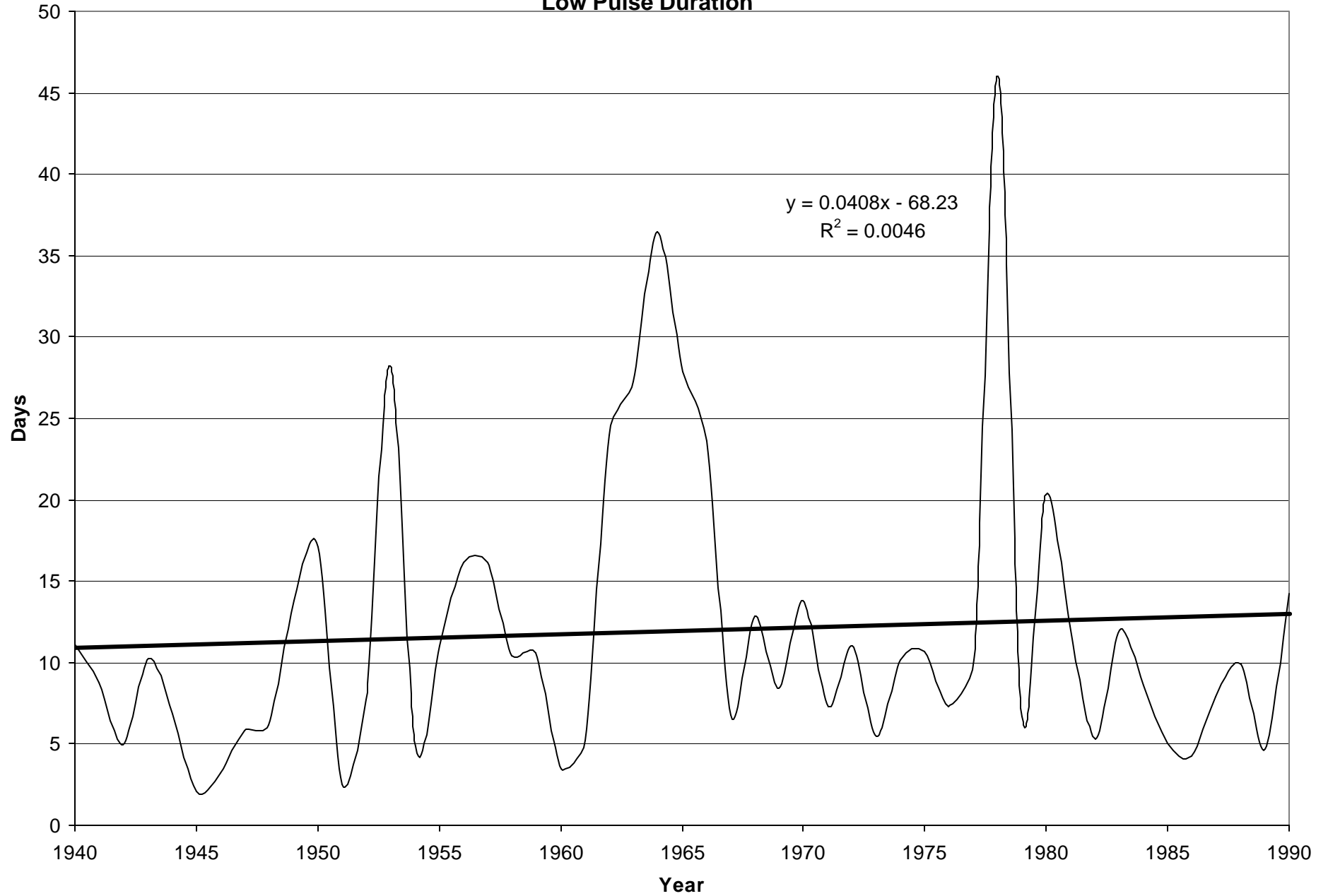
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Julian Date of Annual 1-Day Maximum Flow**



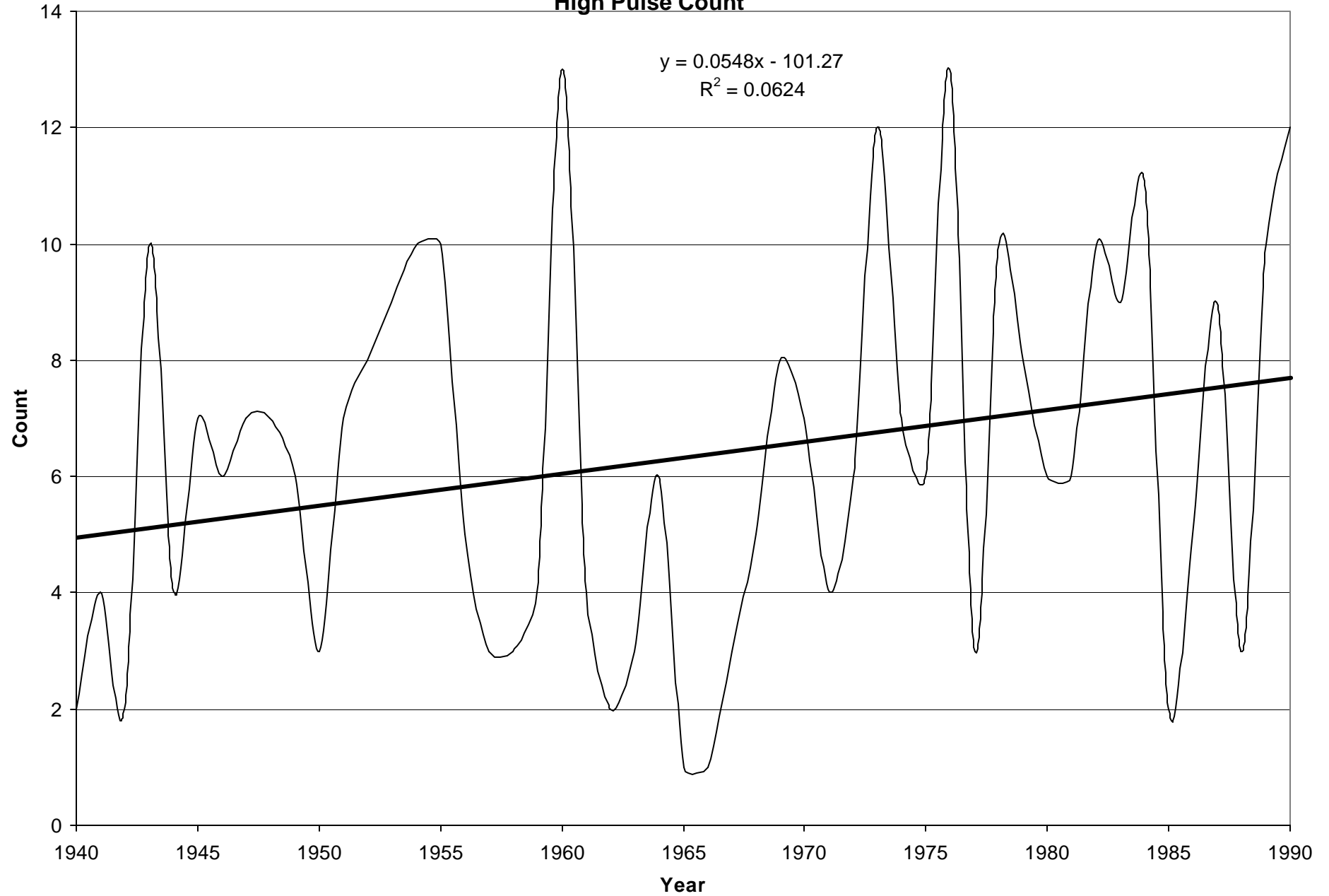
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Low Pulse Count**



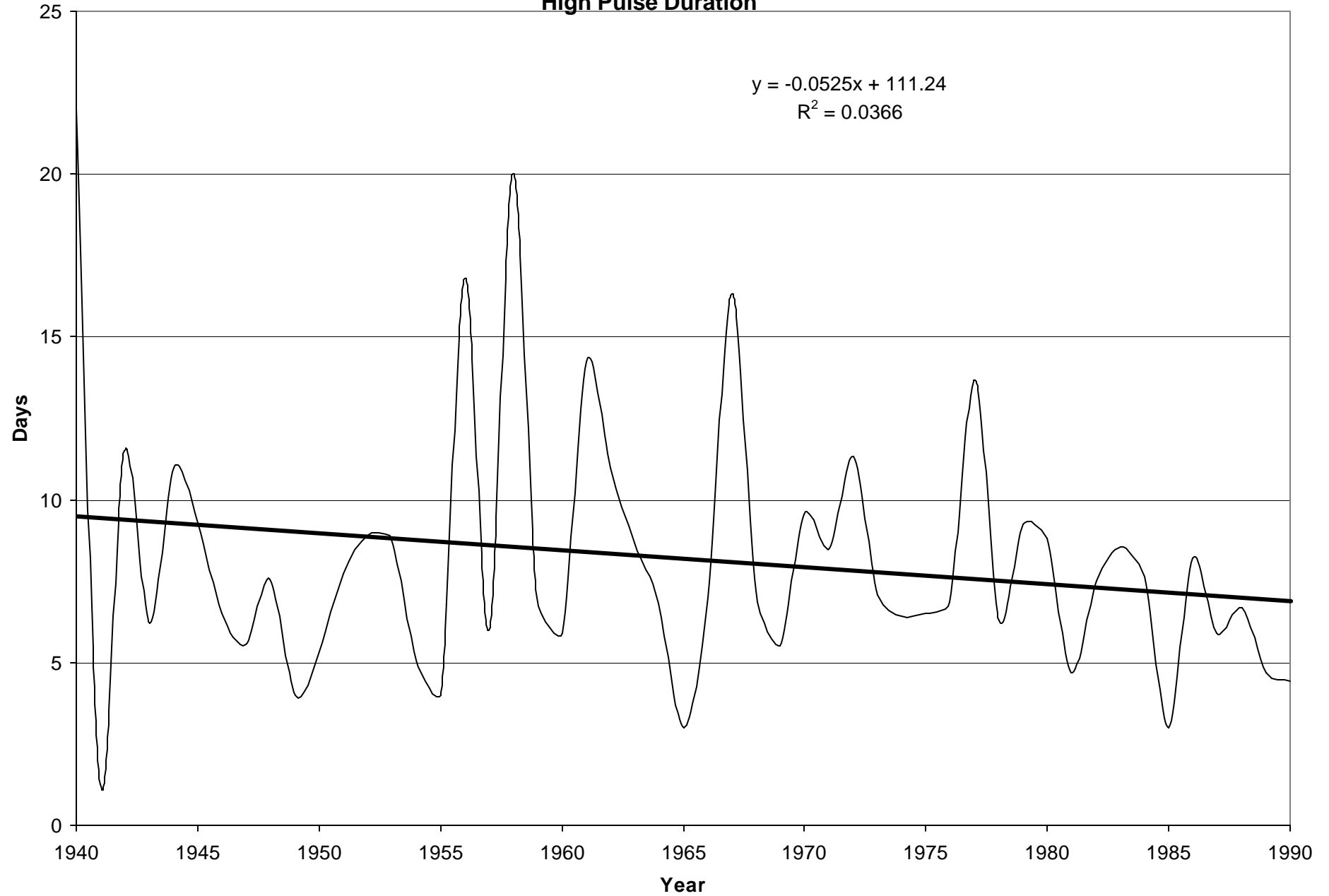
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Low Pulse Duration**



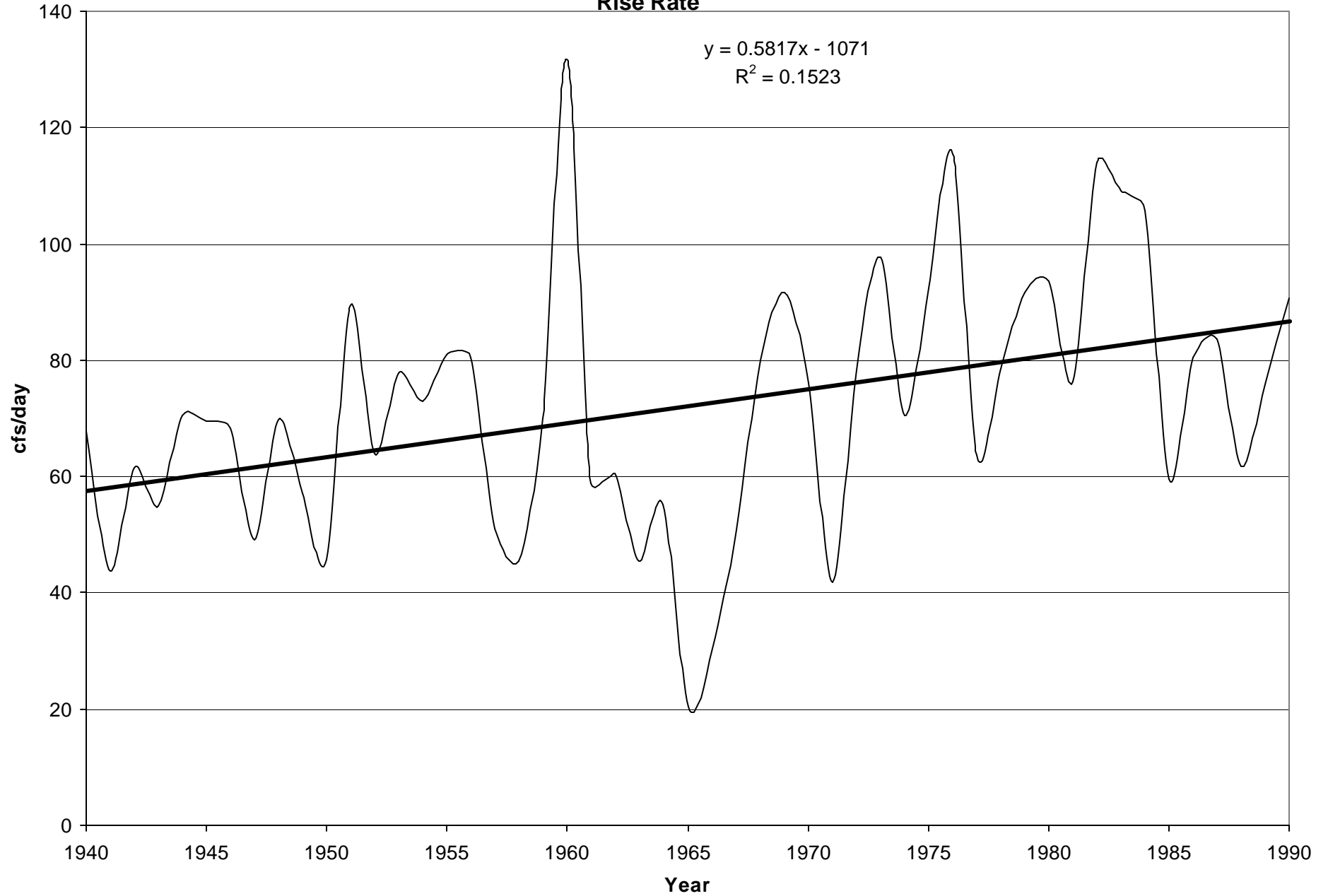
**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**High Pulse Count**



**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**High Pulse Duration**

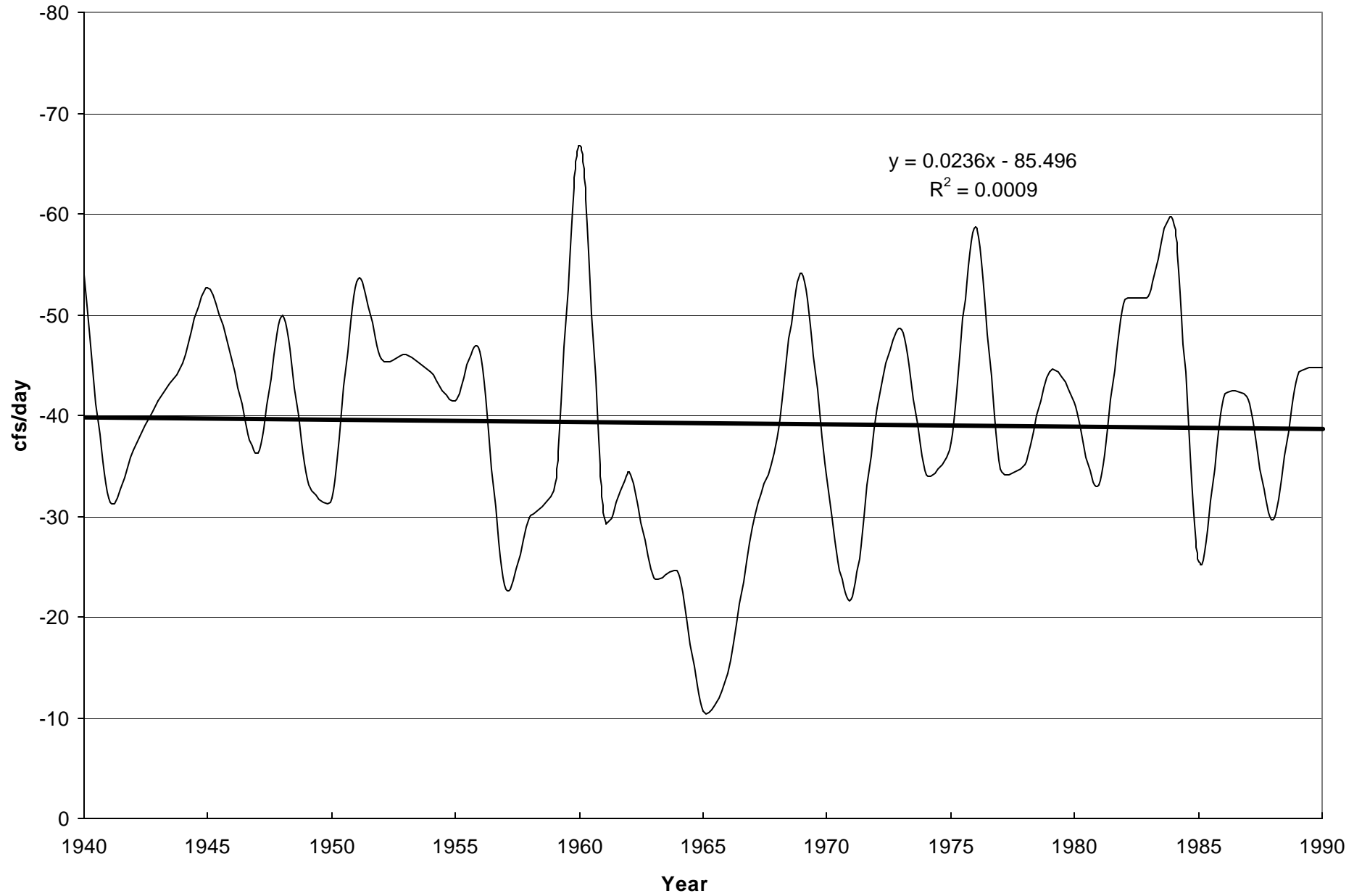


**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Rise Rate**





**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Fall Rate**



**Millers River at South Royalston, Drainage Area= 189 sq mi**  
**Reversals**

